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TEACHING CONSERVATION

By Ward P. Beard

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A Publication of THE AMERICAN FORESTRY ASSOCIATION

TEACHING CONSERVATION

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TEACHING CONSERVATION

A Guide in Natural Resources Education

By

WARD P. BEARD

Assistant Director, Vocational Education
U. S. Office of Education

Formerly Education Specialist
U. S. Forest Service

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INTRODUCTION

The success of natural resource conservation in America rests upon a thorough understanding by citizens of the value of forests, soil, water, wildlife and related resources to individuals and their communities and to their state and nation. Education to bring about this understanding should begin in the public schools.

This is given special emphasis in the current action program of The American Forestry Association, adopted in 1947 after a factual appraisal of the war's effect on the forest producing lands of the country. It calls for a coordinated nationwide campaign by all interested agencies and organizations employing every available medium to develop public awareness of the importance of natural resources to economic and social welfare. *Teaching Conservation* is presented by the Association as a major contribution to this campaign—an aid to the teaching of conservation in the schools.

Founded in 1875, The American Forestry Association is the oldest national conservation organization in the nation. It is a citizens' organization, independent and non-political, supported by thousands of men and women from all walks of life. Its single purpose is to bring about the intelligent management and use of forest lands and related resources of soil, water, wildlife and outdoor recreation. Its official magazine *American Forests*, published monthly, is devoted to the furtherance of this aim.

FOREWORD

"TEACHING Conservation" is intended primarily to provide teachers with the basic understandings for *effective teaching of conservation.* To do so the author has attempted to set forth (1) a proper concept of conservation by use of certain facts about natural resources (2) the educational principles to be followed in using natural resource information to give students an understanding of conservation.

The book does not purport to be a source of information about the conservation of natural resources, even though conservation facts are used for illustrative purposes. For the convenience of teachers many such sources are listed in the appendix. Nor is the book intended to provide teachers with ready-made lesson plans or units. Some items of this kind are listed in the appendix and a part of a West Virginia unit is included as an example of proper treatment of conservation.

The activities at the ends of the chapters are for teachers or prospective teachers in extending their preparation beyond the discussions in this book and are not for elementary or secondary students.

This book should be found most useful as a textbook and reference:

1. In conservation workshops for teachers.
2. In college courses in conservation and education.
3. For faculty and teacher association study groups.
4. For the individual teacher.
5. For professional workers and leaders in conservation education.

The need for this book became apparent to the author while conferring with conservationists and educators in all parts of this country. Their eagerness to know what others were doing and thinking in the field of conservation education and the evident lack of under-

standing of conservation have been the incentives for this production.

With little material available describing experience in teaching conservation and still less research data on such teaching, it has been necessary to study a wide range of conservation subject matter in relation to sound educational philosophies and techniques.

Many ideas in this book have grown out of the author's participation in state programs of conservation education in West Virginia, Tennessee, Wisconsin, Oklahoma and Colorado and his work with educators in many other states.

A preliminary draft of the manuscript was used in teacher training courses at the University of Tennessee. Later the Garden Clubs of Alabama, the Alabama Department of Conservation, the Alabama Wildlife Federation and the Alabama Department of Education cooperated in supplying a mimeographed edition to Alabama teachers. This experimental use has been of great value.

It is hoped that this book will stimulate thinking in conservation education, lead to needed research, encourage definite organization of state, county and city school systems for work on conservation, stimulate teachers colleges to supplement their courses in conservation with methodology for teaching conservation and help those who write textbooks to reveal definite, vital and sound conservation concepts.

WARD P. BEARD

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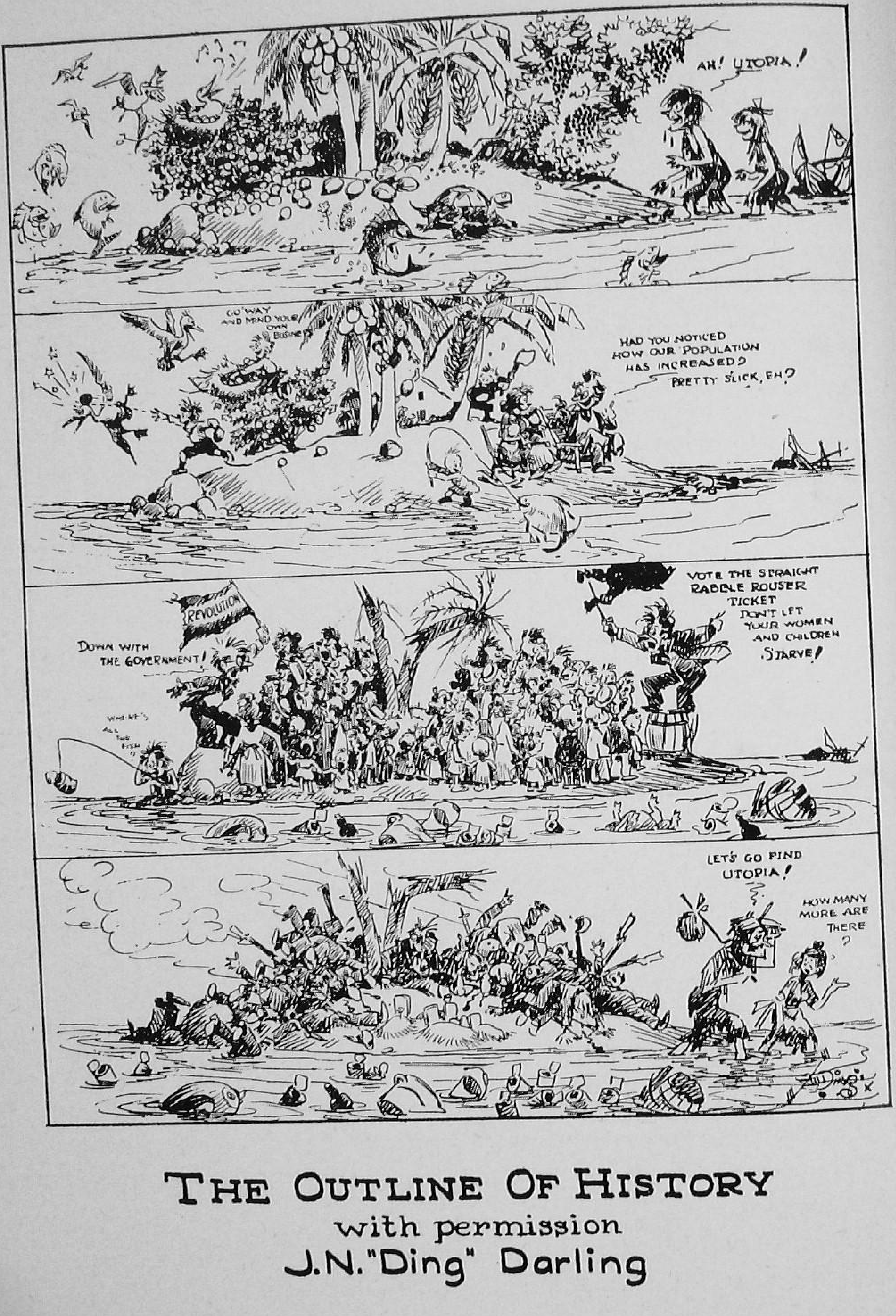
Many others have contributed indirectly through their encouragement of the author in this undertaking.

The author also recognizes that much of his philosophy of conservation stems from his experiences as Education Specialist in the U. S. Forest Service, particularly his association with George Duthie, Dana Parkinson and Herbert A. Smith.—W. P. B.



THE OUTLINE OF HISTORY
with permission
J.N. "Ding" Darling

Chapter I

CONSERVATION PROBLEMS DEMAND ATTENTION

"THE Outline of History." Let's look again at this cartoon. The most obvious idea is that when man destroys natural resources he injures himself.

Closer study reveals:

1. An island environment indicating that natural resources are limited.
2. That when undisturbed by man nature develops a natural balance in a given area.
3. That man's activities are likely to upset that balance.
4. That when population increases to a certain point man's plight becomes steadily worse until he must seek other sources of sustenance or perish.
5. That there comes a time when there is no other Utopia to which man may go.

The island in the cartoon is significant because Utopia was originally described as an island and because it symbolizes the areas of natural resources now abused by man to his own disadvantage. We should recognize as "islands" such areas as lakes, streams, valleys, watersheds, plateaus and other geographic units in which plant and animal life have become adjusted to the environment.

The island in the cartoon might have been large enough for a few people, but when the population increased, the rate of use and abuse of natural resources also increased, and the rate of resource reproduction decreased. When the latter happens the danger point has been reached.

The "island" of natural resources that we know as North America is still big for our population. But if our population doubles in the next century, as has been predicted, the result will be equivalent

to our "island" shrinking to half its present size. There already exist on this continent many areas that have been despoiled to the extent that the population has moved or is living poorly.

SOME PROBLEM "ISLANDS"

How many deer? Deer had almost vanished from the forests of Pennsylvania by 1900. Consequently deer sanctuaries were established and a law was passed prohibiting the killing of doe. Within fifteen years orchardists and farmers were complaining that deer were destroying appreciable quantities of their crops. Soon foresters observed that deer were browsing seedling trees so closely in certain areas that forest reproduction was practically impossible. Solving the problem of too few deer had led to the problem of too many deer. The following solutions were suggested: Fence the deer out of crop and reforesting areas; trap and move some of the deer; permit increased hunting including the killing of doe.

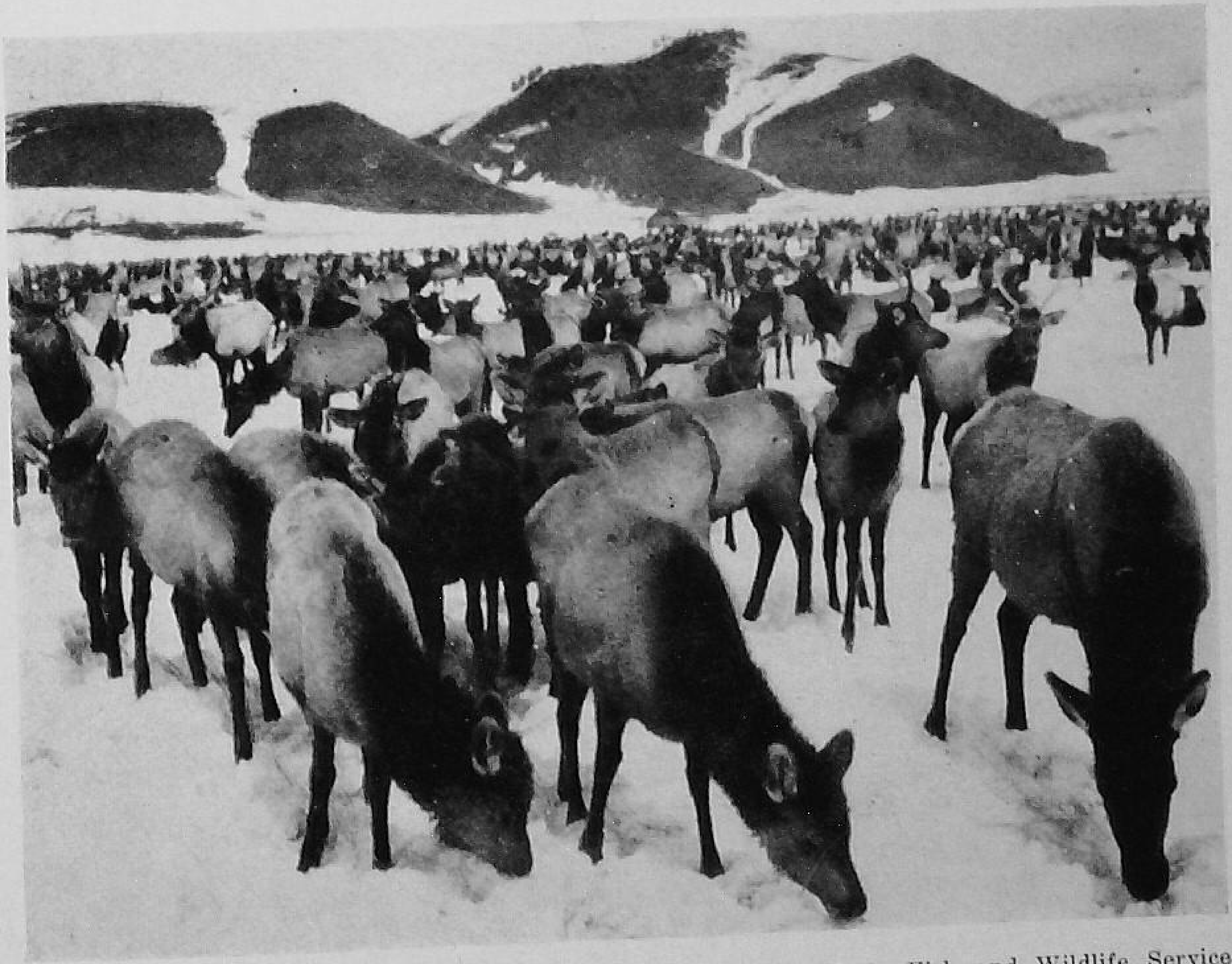
The famous Kaibab (Arizona) Forest deer disaster was brought on because certain groups did not want deer killed. As a result the deer overpopulated the area, overbrowsed and killed vegetation to the extent that thousands of animals starved to death. The controversy as to who had authority over the deer was carried to the Supreme Court of the United States.

Mining and irrigation. On the eastern slope of the Rocky Mountains mining activities resulted in the pollution of streams rendering the water unfit for irrigation and other purposes by farmers farther down the stream. Situations of this nature have been numerous and the cause of much suffering. Laws cover some cases of water rights adequately. Lawmakers and jurors must understand the principles of conservation.

Recreation and lumber. Tourists are thrilled by the giant Douglasfir in the Pacific Northwest. Therefore, those who profit from tourists want these trees left standing, at least strips of them along

the highways. But many of these forests are owned by lumber companies and others not in the tourist business. Foresters say such strips must be about one-half mile wide or the trees will blow down. The owners can hardly leave such an amount of valuable timber uncut and still stay in business. Are the people who want the roadside strips willing to pay for them? Can a system of cutting be developed so these strips will not be a loss to the owners?

Elk and cattle. Great herds of elk exist in the Jackson Hole country of Wyoming. Some of the elk range is also valuable for cattle. Both cattle and elk winter in the valleys. Here the elk eat the hay put up by the ranchers for their cattle. The cattle business of ranchers and the elk business of sportsmen thus are in competition. Both ranchers and sportsmen must know all the facts in order to reach a mutually satisfactory solution.



U. S. Fish and Wildlife Service

Part of the Jackson Hole, Wyoming, elk herd—winter feeding.

A FEW OF OUR MAJOR CONSERVATION PROBLEMS

1. To what extent should unprofitable farm land be reforested or regrassed and new land be brought into cultivation through drainage and irrigation?
2. To what extent should public funds be spent to control floods? Should people be allowed to live in areas subject to flooding?
3. If any industry pollutes the air or water in an area, should the industry be closed? What other alternatives are there?
4. The minerals and organic matter that make our soil fertile are being carried to the ocean in our muddy streams. Can this be checked? How? At whose expense?
5. These constituents of soil fertility are carried to our cities in the form of food and thence through the sewer to the ocean. How can this loss be checked?
6. How can the resources of the oceans be used more effectively?
7. Shall we use our oil resources without control and depend on other fuels for the future?
8. To what extent should we send our natural resources to other countries for cash in return? For services? For other natural resources?
9. Does "splitting the atom" have any bearing on conservation?
10. How much can we rely upon the use of DDT and other chemicals in extensive areas to kill certain forms of insect life?
11. What factors should be considered in determining whether the building of a great dam is a conservation measure or not?
12. How important is a national inventory of our natural resources? Should such inventory be made? By whom? How extensive or how accurate?
13. How do our national policies of nonaggression and our increasing population affect the need for conservation of our natural resources?

EDUCATION AND THE PROBLEMS OF CONSERVATION

Authorities have spoken. President Franklin D. Roosevelt, speaking before the 1938 summer meeting of the National Education Association in New York, said, "The only real capital of a nation is its natural resources and its human beings. . . .

". . . . If we skimp on that capital, if we exhaust our natural resources and weaken the capacity of our human beings, then we shall go the way of all weak nations. . . .

". . . . It is well to remember that our poorest communities exist where the land is most greatly eroded, where farming does not pay, where industries have moved out, where flood and drought have done their work, where transportation facilities are of the poorest and where cheap electricity is unavailable for the home. . . ."

Stuart Chase, well-known conservationist-writer, in an article in

Tennessee Department of Conservation

The construction of soil-saving dams on the school grounds is an excellent way to start a conservation instruction program.

the NEA Journal, said, "We attach great importance just now to the preservation of our democratic system of self-government. It is well that we do this. But how can democratic civilization survive if the soil itself is impoverished and destroyed? Let us as a part of our processes of education lead every child to love the soil and to appreciate its relationship to human welfare."

Dr. John W. Studebaker, U. S. Commissioner of Education, has said, "The problems of conservation have become of paramount importance in our national life, and the need of considering them in the program of the public schools is being increasingly recognized."

A true story. A visitor to the area of the Tennessee River watershed observed a very large gully. The unusual size of the eroded area caused the traveler to ask questions. The answers revealed that once this field had been fertile and productive and that formerly the community schoolhouse had stood at the bottom of the slope. Now the gully not only replaced the once useful field but also the school site. The visitor was impressed with these explanations and thoughtfully commented, "I wonder what they taught in that school."[1]

ACTIVITIES

1. Compare a lake, a stream, a valley or a mountainside with an island from the standpoint of conservation.
2. Give an example of what is meant by "have-not" nations.
3. Report on details of some conservation controversy such as the Kaibab deer disaster or the Jackson Hole elk herd.
4. List major natural resource problems in your community.
5. Report on the connection between conservation projects and the location of the atom bomb plants at Oak Ridge, Tennessee, and Hanford, Washington.

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[1]Maurice F. Seay, University of Kentucky.

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Chapter II

CONSERVATION, ITS MEANING AND SCOPE

MISUNDERSTANDING common. One teacher said, "We teach conservation by having the children save paper towels."

Another said, "Yes, we teach conservation—the conservation of time, effort, wildflowers, buildings, electricity and food."

Another said, "Conservation is the idea of 'taking care of.' Our students are taught to pick up their tools and put them away, to darn their own stockings and to take care of their health."

Another said, "We do not teach conservation." But an examination of the school's course of study revealed that here and there throughout the science and social studies courses were concepts fundamental to an understanding of conservation.

Only a cursory examination of the teaching materials now available in the field is needed to reveal that many of the writers of instructional materials do not understand the real meaning of the term "conservation" as applied to natural resources. In much of the literature the term is used synonymously with thrift, save, protect or preserve. Some consider all nature study, all biology, all safety and the study of health as conservation education. There is a certain amount of common ground between these fields and conservation, but they are not identical.

An outline of a published unit on forestry starts out with a study of trees, moves on to the uses of lumber, leaps to landscape paintings, thence to a lengthy study of the artist's life, more attention being given to the latter than to forests.

Identification of trees is one of the most common "conservation activities" in schools. It is a good starting point for some grades but too often the instruction does not get beyond identification to its significance in solutions of problems of conservation.

Here are examples of statements found in textbooks that show a lack of understanding of conservation of natural resources: "Possibly a substitute will be found some day so we will not have to use so much wood" — "If we keep on cutting the biggest trees we will soon have no forests."

Conservation is used in a much too narrow sense in the following statement: "Developing, conserving and intelligently using non-human resources." Among those who deal with the natural resources, conserving includes developing and intelligently using.

A major need in conservation education. These remarks and statements indicate that *one of the major needs in conservation education is the clarification of the fundamental concepts of conservation.*

Some place between the narrow "saving of paper towels" and the broad, even vague, ideas that anything and everything may be taught as conservation one should find some *tangible concepts broad enough to be developed and concrete enough to be taught.*

If conservation is interpreted by the teacher as saving, preserving or hoarding, the teaching possibilities are very limited, and the field is soon exhausted with a few sentimental warnings. To teach conservation as hoarding natural resources, or on the basis of "Woodman, Spare That Tree!" is like trying to keep up the Santa Claus myth.

On the other hand, if conservation is presented as anything and everything it loses significance. If it is taught as including such things as "planting hollyhocks along the roadside," "painting the woodshed," "collecting last year's birds' nests," or "the life of a landscape artist," more harm than good may be done.

If schools are to provide effective teaching to the end that students will be better able to solve problems dealing with the natural resources, educators should use the same meaning of the word "conservation" as do foresters, soil conservationists, wildlife specialists and others who work with the natural resources.

Conservation can be delimited and described as an area of learning, as a group of related concepts, teachable, understandable and practical in application in real situations.

Tennessee Department of Conservation

A group of teachers study methods of soil erosion control.

History of the term. One good way to get a proper interpretation is to consider the events leading up to and associated with the origin of the term as now used by technical conservationists. Forest devastation had been a subject of national concern for many years when the government established "forest reserves" in 1891. The term "reserves" was an unfortunate one. To many people it signified a locking up of the forest resources. Later, use of the term "reserve" was discontinued and the areas were called "national forests" as they still are today. The government eventually established a policy of sale of national forest timber, properly cut.

Besides timber there were other resources on the national forests —water for irrigation and for power, much grazing land, some tillable land and valuable mineral resources. Bitter controversies raged over whether these resources were to be given away, often to large

corporations, for private exploitation, or whether they were to be sold or leased with restrictions that protected the public interest.

The policy under which the national forests are administered by the Forest Service of the Department of Agriculture was established by the Secretary of Agriculture in a letter to the Chief of the U. S. Forest Service, on February 1, 1905. He said:

> "In the administration of the forest reserves it must be clearly borne in mind that all land is to be devoted to its most productive use for the permanent good of the whole people and not for the temporary benefit of individuals or companies. All the resources of the forest reserves are for use, and this must be brought about in a thoroughly prompt and businesslike manner, under such restrictions only as will insure the permanence of these resources. . . . You will see to it that the water, wood, and forage of the reserves are conserved and wisely used for the benefit of the home builder first of all, upon whom depends the best permanent use of lands and resources alike. The continued prosperity of the agriculture, lumbering, mining and livestock interests is directly dependent upon a permanent and accessible supply of water, wood and forage, as well as upon the present and future use of these resources under businesslike regulations enforced with promptness, effectiveness and common sense. In the management of each reserve local questions will be decided upon local grounds, the dominant industry will be considered first, but with as little restriction to minor industries as may be possible; sudden changes in industrial conditions will be avoided by gradual adjustment after due notice, and where conflicting interests must be reconciled, the question will always be decided from the standpoint of the greatest good of the greatest number in the long run."

The policy of "the greatest good for the greatest number in the long run" had been established for all resources on the national

forests. President Theodore Roosevelt and Chief Forester Gifford Pinchot saw the use of these interdependent resources as one big problem. Deliberately they set about to select a term that would best embody their policy, tersely stated "wise use." They chose "Conservation."[1] It still means "wise use" to those who administer natural resources. The term "management for sustained yield" is now commonly used to express this concept.

Wise use. This sounds simple but is so only in the abstract. Wise use needs amplification and explanation. An illustration will help. Natural resources may be compared to a bank account. One may check out his entire account in a short time and give an appearance of wealth and prosperity, but finally be destitute. On the other hand, one may check some of it out for productive purposes and thereby earn more to add to the account, with stability and security as the result. Natural resources may be drawn upon so lavishly that they lose their productivity, or they may be drawn upon in such a way that they remain productive. By proper management forests may be made even more productive than wild forests. By proper management fisheries may be increased in productivity. By proper grazing our ranges and other grasslands may produce more beef and mutton.

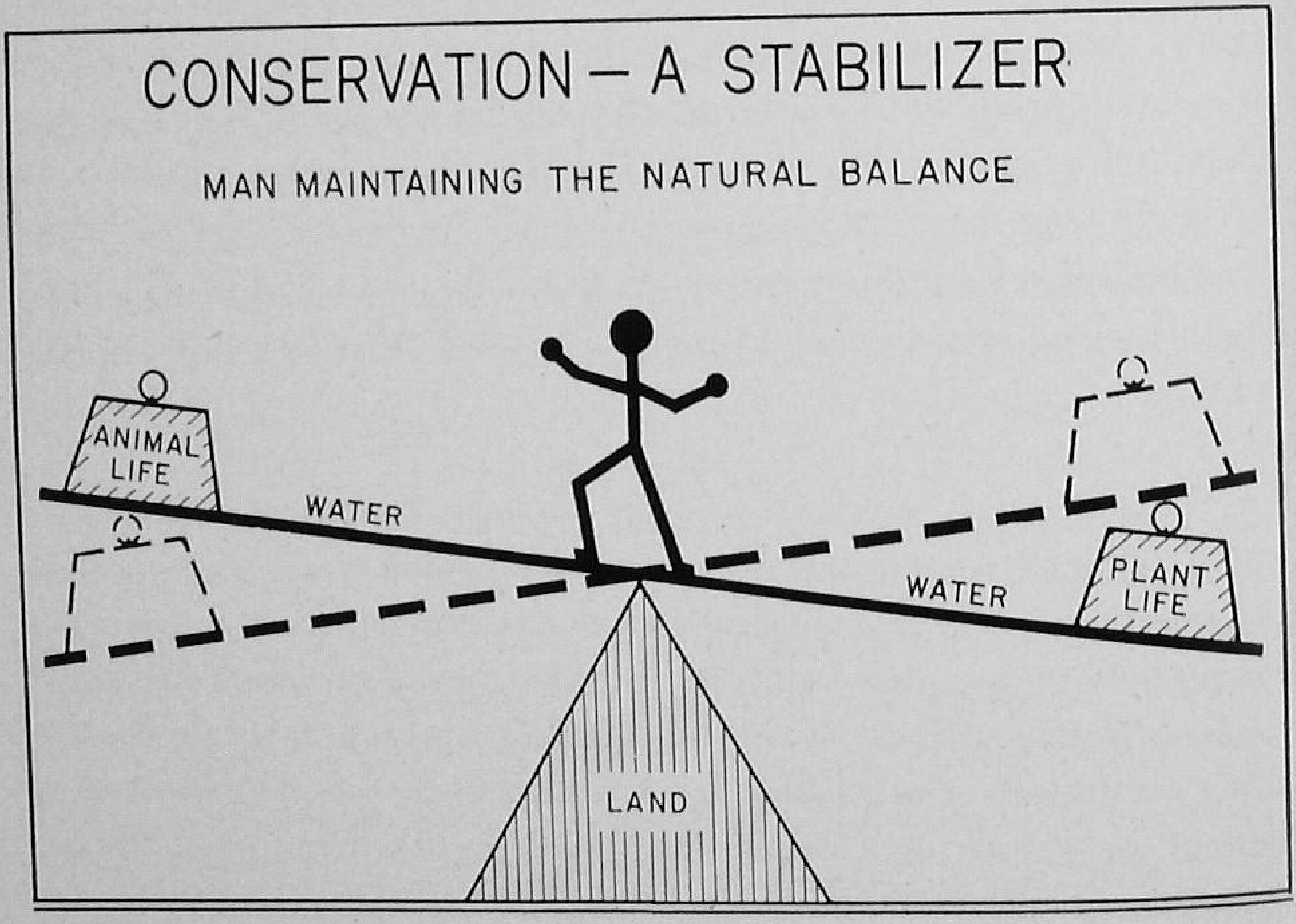
Related terms. Understanding of the term "conservation" may be still further clarified by considering some related terms. *Exploitation* is sometimes used as an opposite of conservation, but it does not necessarily mean unwise use. When it is intended to convey that idea, some adjective such as "wasteful" should be used to describe the use more accurately. *Devastation* is a good opposite, and may be used to denote the results of a catastrophe, such as a killing forest fire or man's abuse and misuse carried to the point that the resource is destroyed. The term *liquidation* expresses the idea that economic pres-

[1]The author is indebted to the late Herbert A. Smith, close friend and associate of Mr. Roosevelt and Mr. Pinchot, for this information. Mr. Smith, while Collaborator with the U. S. Forest Service, gave unstintingly of his time in telling the author about the early days of conservation in this country.

sure often forces owners to turn their resources into money regardless of the future of the resource. It is applicable to much of our disregard for the continued productivity of our natural resources.

SCIENTIFIC, SOCIAL AND ECONOMIC SIGNIFICANCE

Conservation has a scientific base. Conservation practices must be based on scientific facts, especially with respect to maintaining the natural balance. Not only must the worker with natural resources have a thorough knowledge of the science of his particular field, but he must know how his activities will affect other resources, some of them remotely related.



U. S. Forest Service

Conservation is man's control of the natural balance. Man maintains or destroys this balance by what he does to land, water, plants and animals. Land is the pivotal factor. Water ties plant and animal life to each other and to the land. If the balance—which is a swinging balance—is destroyed, man eventually is forced off the land.

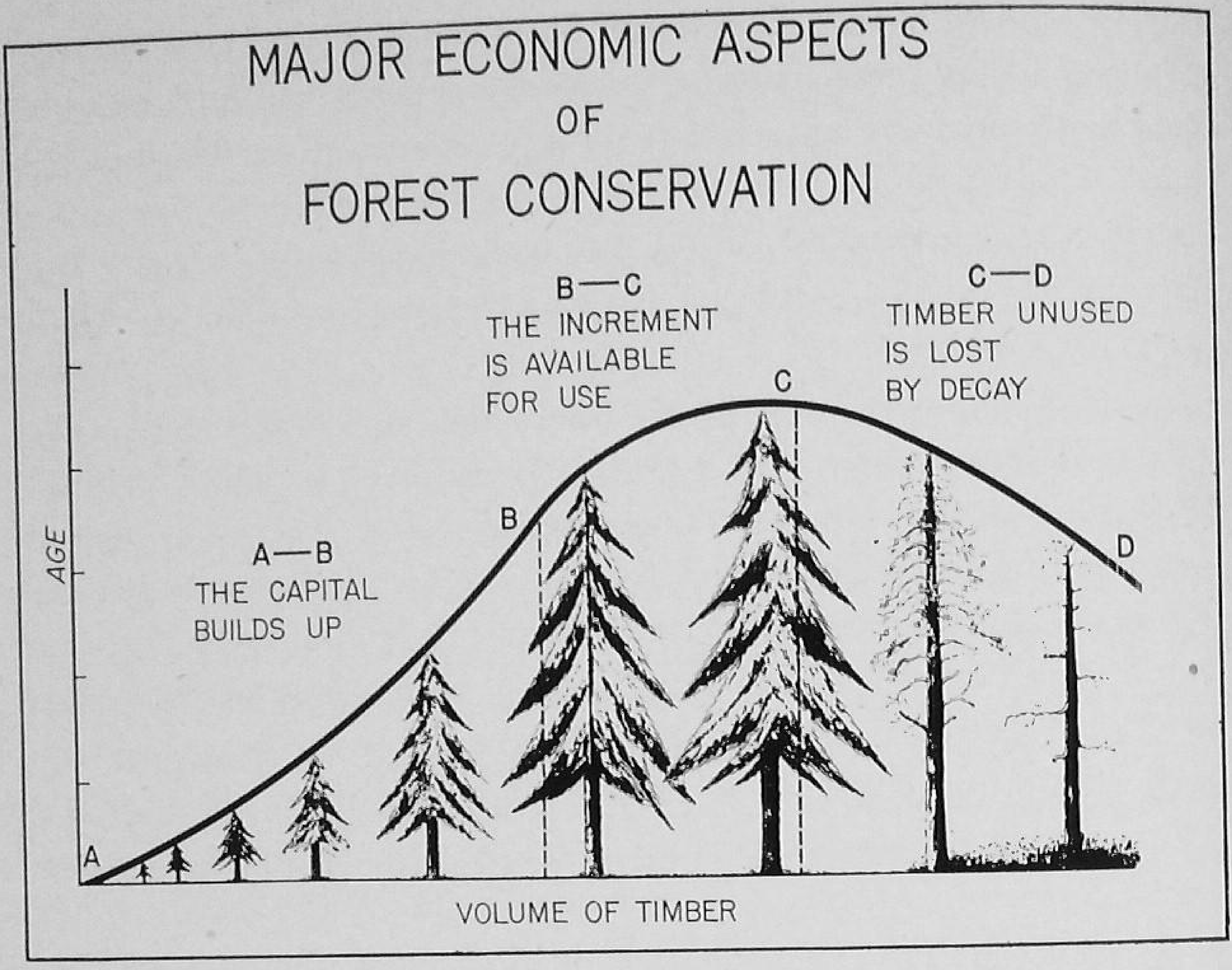
The scientific fact, for example, that water is H_2O, unrelated to a problem in the management of natural resources has little effect on the development of an understanding of conservation. On the other hand, study of how water dissolves certain substances, carries organisms and soil, varies in its free oxygen content, and other such facts as they bear on productivity of streams and other bodies of water, is conservation.

Natural balance often involves complex relationships. A case on record illustrates this. The forests were removed from a certain watershed. Thereafter shipworms destroyed most of the piling supporting wharves in a distant harbor, into which the river emptied that drained the deforested watershed. Removal of the forests permitted rapid runoff causing floods in the spring. Consequently streams were smaller the rest of the year. The decreased flow of fresh water into the harbor allowed the salinity of the water to increase and made conditions so favorable for the shipworms that the wharves were rendered unsound. This is the fundamental principle to which Stuart Chase refers as the "Great Wheel" in *Rich Land, Poor Land.*

Conservation is an economic policy. A person who lives within his income and has money left for productive investment is practicing one of the principles of conservation. If he spends more than his income, he is not. He is soon bankrupt.

Nature provides that a certain amount of plant food becomes available each year in the soil. This plant food is a main factor in determining how much plant growth there will be unless fertilizers are added. In any case the amount of plant growth in time determines how much animal life may be supported. Proper management of soil, plants, and animals then is such as will maintain or increase this annual release of plant food—the interest nature pays for soil conservation.

If man uses only a part of the increment, yearly increase or yield of his natural resources and "plows back" or reinvests the rest to improve the capital, he is practicing conservation. If, on the other hand, he uses all the increment and some of the capital, both will



U. S. Forest Service

There is a certain time for harvest when man may get the most out of his crop, whether it be timber, hay, or apples, and provide seed or a residue for reproduction. Each year there is a certain amount of growth, which economists call increment. As long as man can live on this increment and provide reproduction of the resource, he is safe.

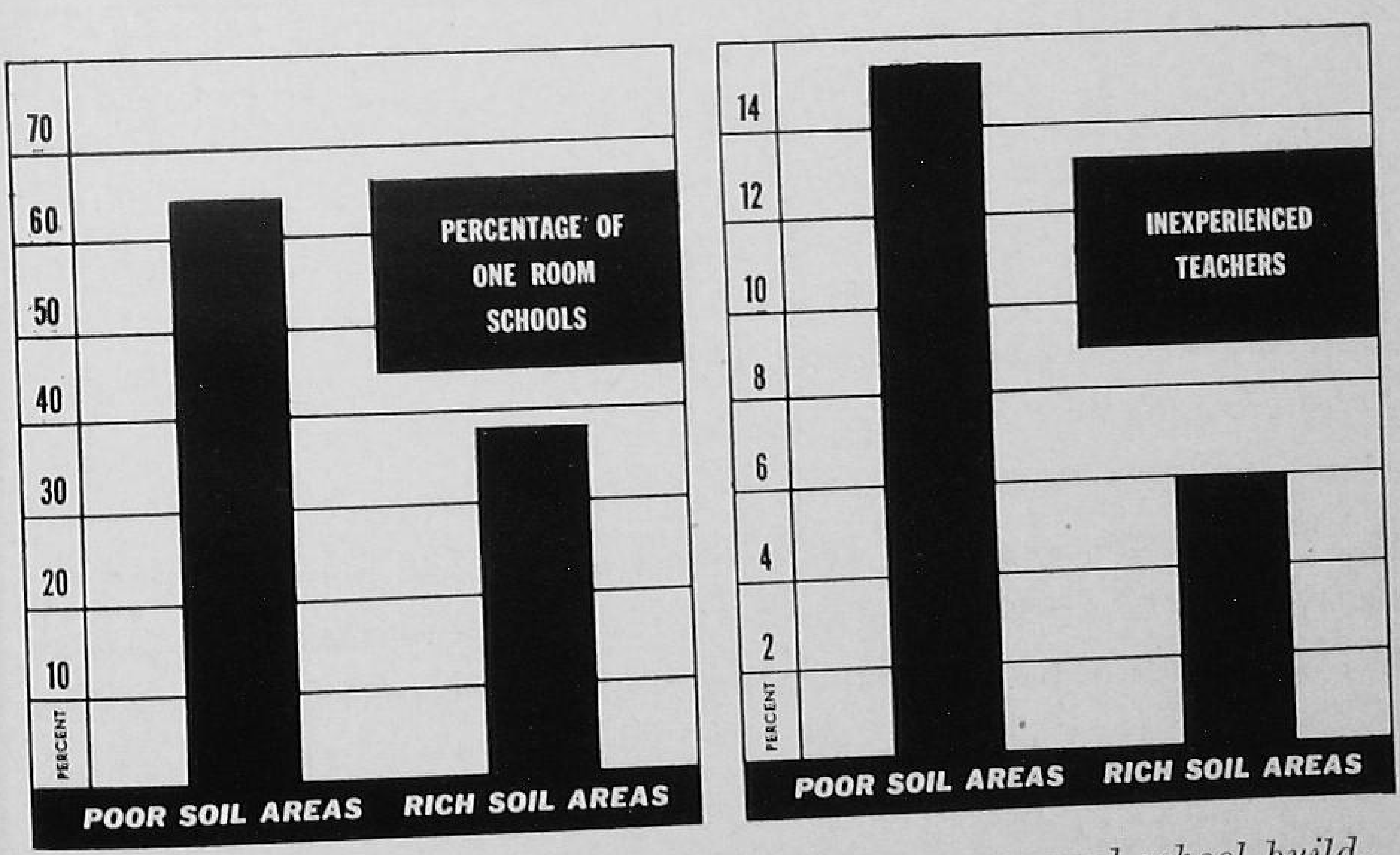
gradually decrease to a point where man can no longer exist. He will have used his principal as well as his interest. On the other hand, if man does not use this yearly increase at the proper time it may be lost to him. Trees, grass and animals grow, reach maturity, die and decay. It is conservation to use the increment when ready if by such use conditions are left so that future yield will be assured.

Conservation has social significance. Gold left in the hills has little or no value. Natural resources have little or no value until used by man. This significant fact is one of the fundamental considerations of conservation. Many of our social problems today are the results of depleted natural resources. Farmers living on depleted

soils, woodsmen living in devastated forest areas, fishermen on fished-out streams, miners working wastefully mined-out veins and the rest of us, indirectly, are victims of a failure to practice conservation.

Conservation deals with the present as well as the future. The pleas for proper management of natural resources have too often overemphasized the future in comparison to present problems. Predictions of calamity in the distant future tend to postpone action. To put the emphasis solely on the future is like crying "Wolf! Wolf!" when the sheep are dying of starvation.

The problem of what we will do for lumber, productive streams and soil fifty or one hundred years from now will be taken care of automatically if we solve present conservation problems of what we are to do with the people living on substandard levels because the forests, grass, streams or soil from which they once made their living have been devastated. Right now the easily accessible timber and



A study made by the University of Tennessee compared school buildings and experience of teachers in six typical counties—three typical of poor-land areas, three of fertile areas. As the charts show, the poor counties had more one-room schools and inexperienced teachers than the areas where soil is more productive.

much of our soil, our rangelands and fisheries have been depleted to the point that cost of production has risen so that we virtually have a shortage of food and timber from the standpoint of the purchasing power of many. People are *now* the victims of liquidating resources. Today's submarginal patches of human and natural resources are the primary reasons for conservation now.

A fallacy in much of our thinking is that a resource is not in need of conservation measures until it is at the vanishing point. It would be just as logical to say a person does not need food until he is about to die of starvation. Long before soil, the basic resource, approaches complete exhaustion it becomes so unproductive that people cannot gain a decent subsistence from it. A similar situation exists with most resources. The need for conservation arises long before the point of unprofitable production occurs. Conservation measures should start simultaneously with use of a natural resource. To delay is to invite disaster. Too often we wait until production is unprofitable. Then a vicious downward spiral starts. It matters not whether it starts with human ignorance or an inadequate resource.

Without conservation profitable production dwindles to subsistence. Subsistence with poor food, clothing and shelter bring on ill health, indolence, discouragement, poor schools, churches and low moral standards. The spiral descent has a momentum so great that without help from other sources nature closes the books with the last inhabitant of such areas.

Conservation is proper land use. The fact that all renewable resources spring from the soil and that the development of mineral resources requires use of land reduces the problems of conservation to the problem of land use. An ideal situation would be one with all land devoted to its best use whether for forest, brush, swamp, grass, cultivated crops, lake or stream bed or flood plain, industrial site, recreation area, watershed or for wildlife production. It will be seen at once that some of these land uses may be coordinated with others, some are exclusive of the rest. The same piece of land may produce

timber and serve as a watershed for city water supply but not as an industrial site.

Land-use problems involve not only the kind of use but the question of ownership. Which land should be in private and which in public ownership?

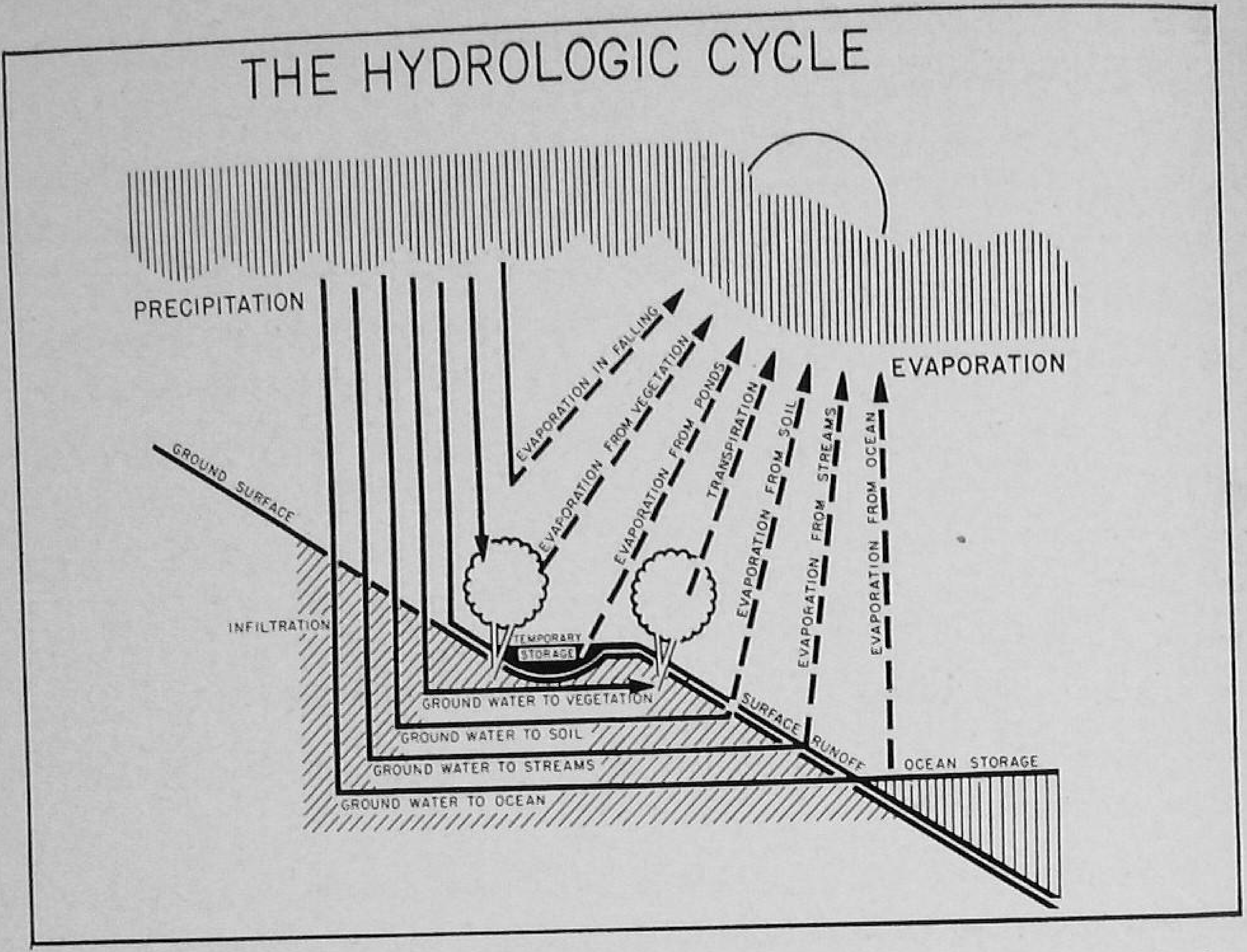
Land-use problems vary from an over-all general use of a large area to subordinate uses of certain parts of the area. For example, a 100,000-acre tract may be designated as forest land. Within this area may be a tract of 10,000 acres devoted primarily to watershed protection; another 10,000 acres primarily to grazing; another tract primarily as a wildlife sanctuary, small tracts here and there for recreation purposes, and the rest to timber production. To decide what is the best use of a piece of land requires a scientific knowledge of soils, plant life, animal life, water, climate, economic and social factors.

NATURAL RESOURCES NEEDING CONSERVATION

The five major natural resources. The conservation of natural resources may be considered as applying in the following five major fields: (1) soils; (2) water; (3) forests, grasses and other vegetation; (4) wildlife, including bird and aquatic life; and (5) minerals. Any natural resource may be listed under one of these.

Of these five resources, soil or land is the most important for the others all spring from or depend upon the land. Next in importance is water. The circulation of water (the hydrologic cycle) with the process of photosynthesis makes possible plant growth, the basis of animal life.

Conservation deals with the controllable. Occasionally, climate, sunlight, air and natural forces have been listed for consideration in teaching conservation. It is true they are natural resources but they are not subject to conservation as are other natural resources. This listing indicates a lack of understanding of practical conservation.



Soil Conservation Service

An understanding of the circulation of water is fundamental to an understanding of conservation. Man's proper control of water on the ground is the sine qua non *of conservation.*

In the first place, conservation implies that certain resources are exhaustible and in the second place, that something can be done to control the resource.

If the sun's energy is exhaustible, there is nothing that we can do to the sun to check its radiation. We can, however, control its effects by our management of plants, animals, water and soils. Man may pollute the air in certain areas. The line of attack on such a problem is not on the air but on the process causing the pollution.

As for natural forces man cannot prevent nor make gravity work. But he can decrease harmful effects of gravity in falling water by controlling the soil and soil cover and the water after it falls.

To include sun, air, natural forces and the elements of weather in the category of natural resources about which we are concerned

in teaching conservation would contribute little, and certainly would confuse the issues.

The term "nonhuman resources" has been used to designate the enlarged category which includes natural forces, air and everything else but people. The indefiniteness of the "nonhuman" category may lead to a confused concept of conservation and destroy effectiveness of education for the conservation of the major natural resources.

It is recognized that works of art and historical sites should be preserved. They are not, however, natural resources. Art is a product of man's work just as is clothing, food or shelter and hence has no more place in a list of natural resources than other things made by man. Historical sites are a form of land use in the same category as urban or industrial sites and therefore may be subject to conservation measures, but the historical aspect is man-made and therefore not a natural resource.

The classifications, soil, water, forests and grasses, wildlife (including bird and aquatic life) and minerals is the accepted list of basic natural resources among natural resource authorities.

Renewable and nonrenewable resources. To understand conservation of natural resources, it is necessary to recognize that some resources, forests, grasses, wildlife and, in a broad sense, soils are renewable, and that minerals from a practical standpoint are nonrenewable or fund resources.

Minerals stand in a category by themselves. The others are all renewable resources. When the last gold has been taken out of a mine, there will never be any more in that mine.

This fundamental difference between the renewable and nonrenewable resources makes a great difference in the conservation measures that apply.

CONSERVATION ACTIVITIES

There are five phases or primary activities in which man engages in conservation — *inventory, utilization, protection, substitution* and

restoration. To each of the five primary activities there are three contributory activities, *research, cooperation* and *planning*.

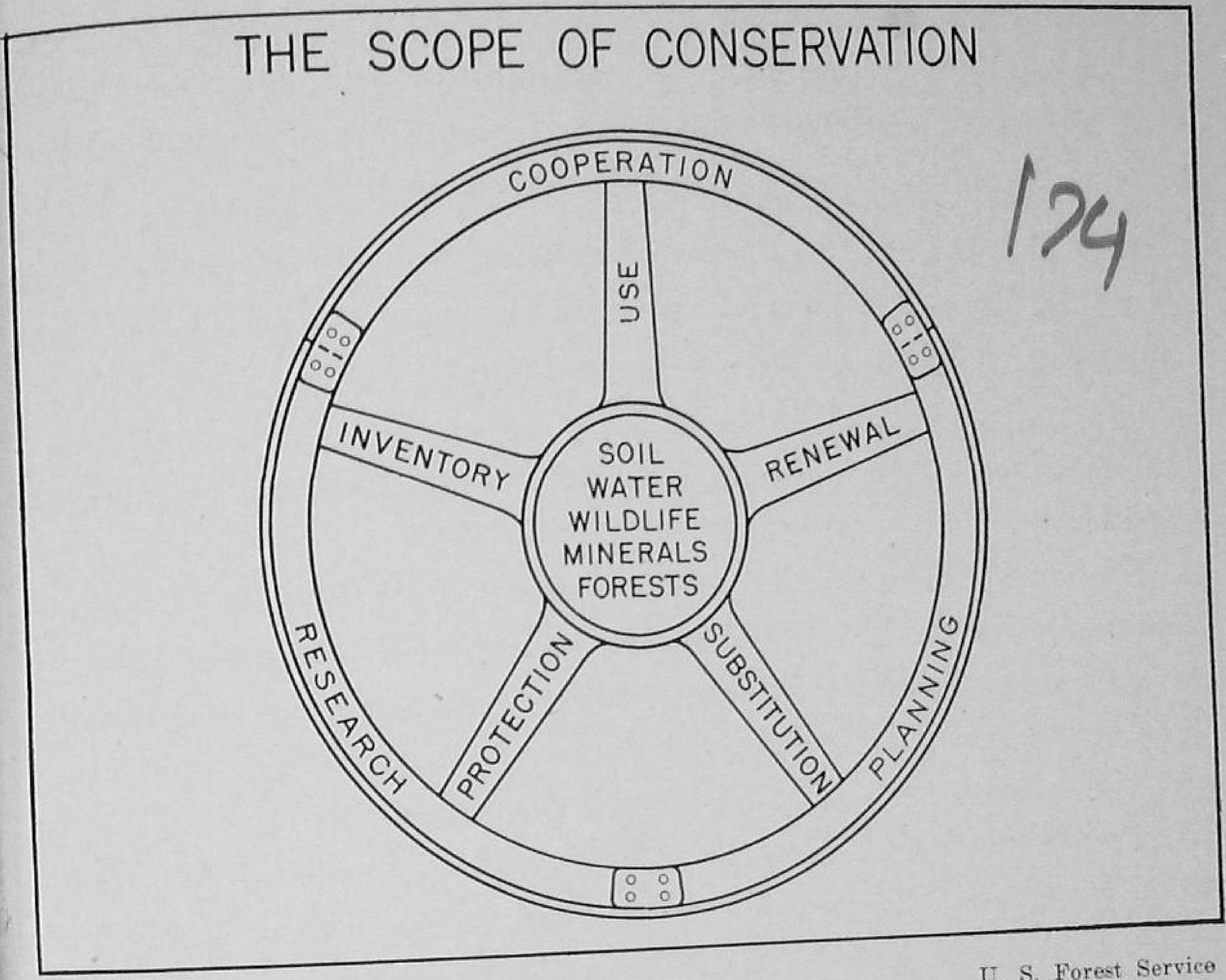
Inventory means finding out how much of the resource there is, where it is, its quality and its availability. Getting this information on all the forests, soils and wildlife of this country is a big and difficult task.

Utilization is the keynote of conservation. Efficient use without waste, use without destroying the productivity of the resource, use for the good of the greatest number, are of first importance in conservation. Utilization may include aesthetic appreciation as well as consumption of material. The problem is made more complex because uses change from time to time.

Protection covers such activities as forest fire prevention, maintaining wildlife sanctuaries, setting bag limits for hunters and protecting soil from wind and water. Protection is not inimical to use nor is it the sole activity in conservation.

Substitution is typified by use of a plentiful resource for a scarce resource or replacing one species with another in an area. Substitution is frequently overemphasized as a conservation measure, especially as a means of preventing the depletion of a resource. Ordinarily when a resource approaches depletion the prices of commodities made from the resource go up and use automatically declines.

Restoration is getting a resource back to its original productivity. Reforestation, controlled grazing, application of fertilizers to soil and transplanting wildlife in depleted areas or fish in streams are typical restoration activities as applied to renewable resources. It embodies the idea that man acts to start or speed up the natural processes of growth and increase in a resource that has been misused.



U. S. Forest Service

A symbol of the scope of conservation, man depends on the balance of this wheel. Forests stand for all vegetation, wildlife for all animal life.

A comparable term for nonrenewable resources, in which there is no growth or increase might be *salvage*. An example is the recovery of used and discarded metals. The extent to which salvage is carried on is usually determined by prices of the material and costs of recovering and reprocessing. Many times new metal can be mined cheaper than old metal can be salvaged. It has been cheaper to import tin than to reclaim it from "tin" cans.

Research might be considered as implied in the other activities. Unless man finds out all the facts about the resources with which he deals, he may do more harm than good in his efforts to improve conditions. Research determines how best to harvest a forest, how best to prevent insect outbreaks, how best to build a terrace, how to do a thousand other jobs that arise in dealing with natural resources.

Planning is closely related to research. In planning all the facts and factors are considered in the solution of a problem. Good planning includes consideration for and by all parties concerned with a resource problem. Local, regional and national planning is necessary.

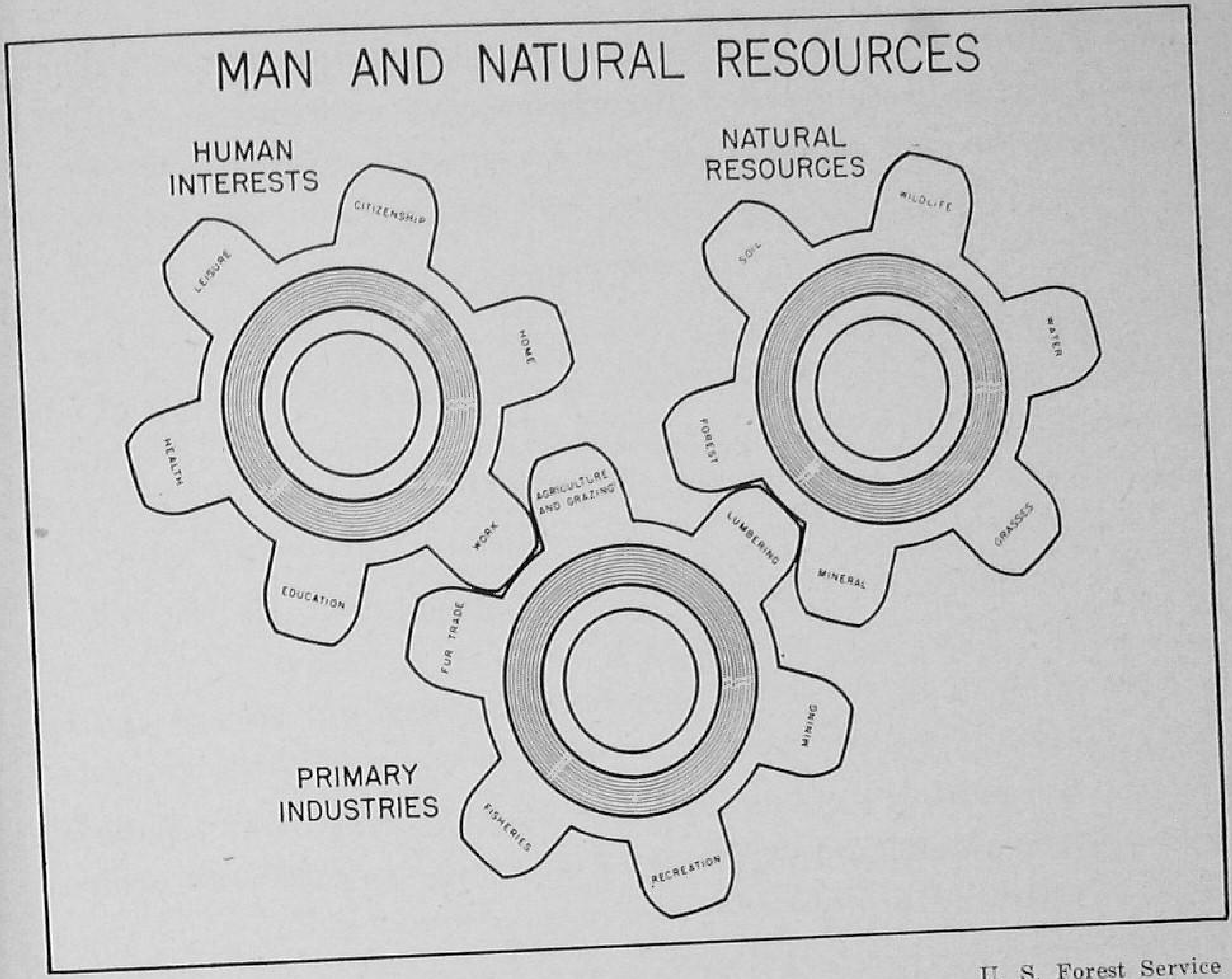
Cooperation is necessary in conservation activities because a resource is often jointly owned, because the public has an interest in maintaining all natural resources and because the resources are interdependent. All are geared into the "Great Wheel" or natural balance.

The livestock owner and the man who wants more elk, the miner and the irrigation farmer, the public and the private owner have to concede something to each other. There is usually a sound middle ground for agreement.

The cooperative program of forest fire protection is an example. Most private owners are unable to afford complete forest fire protection. Because of the public's interest in forests, federal and state funds have been made available to assist the owner to protect the forest if he joins a cooperative protective association.

Conservation is a matter of production, primarily. In general it may be said that the method used in the production of a commodity springing from soil is a more important phase of conservation than is the way in which the commodity is used after it has entered manufacturing processes or trade channels. The method of harvesting timber, for example, has greater effect on the productivity of the forest resource than does the use to which lumber is put in construction. Cutting timber properly so the forest will remain productive is the main consideration in forest conservation. The abuse of the lumber in construction is, of course, an economic loss to the owner, but such misuse in itself has little direct effect on the forest and the people who earn their living from it.

Consumption indirectly affects the forest through the demand for timber. Too great demand may lead to "clear-cutting"—that is, cutting everything, big and little—in order that a maximum return



U. S. Forest Service

As shown here, man's wants (human interests) are filled through the primary industries which, in turn, are dependent on natural resources. If one cog is worn down the whole machine loses efficiency. Not only does each resource, or cog in the wheel, affect man's wants through a corresponding primary industry, but what happens to each resource will affect other resources and therefore other primary industries and finally, man's wants.

may be realized. Likewise a poor market requiring little lumber may lead to abuses in cutting the forest because small scale operation may reduce the margin of profit so much as to preclude any additional expense for conservation measures. Thus it may be seen that an increase in consumption of natural resource products in one case and a decrease in consumption in another may lead to conservation. It depends on what happens on the land where the resource is being obtained.

Note: So far this book has provided a digest of the principles of conservation in order that the teacher might have a better basis for

what follows regarding the teaching of conservation. The teacher should add to his knowledge of conservation by further study. Activities at the ends of the chapters are suggested for that purpose.

ACTIVITIES

1. Read the following books: *American Conservation — Rich Land, Poor Land — Deserts on the March — Behold our Land*. These and others are described in the appendix.
2. Make a list of the state and federal agencies and nonprofit organizations engaged in conservation work in your community.
3. Make a list of the names and addresses of their personnel from whom you may secure help in teaching conservation.
4. Get a supply of one-cent post cards. Secure from agencies listed in the appendix lists of materials available and make a selection for your own use.
5. Arrange trips with field personnel of these agencies.
6. Enroll in a course in conservation.
7. Find out where conservation workshops are to be held, what they offer and what arrangements have to be made to attend. Write to The American Forestry Association, Washington, D. C. for such information.
8. Foster the organization of a faculty committee to study and promote the teaching of conservation.
9. Promote the study and the teaching of conservation in teachers' associations.
10. Make a collection of units of instruction in conservation.
11. Read details of the history of the conservation movement.
    a. What is your opinion of the usual Arbor Day ceremonies as a conservation activity?
    b. What two schools of thought developed among conservationists? Do they exist today?

12. Sharpen your concepts of conservation by
    a. Pointing out the difference in meaning of "conserving" implied in these two clauses,
        (1) "Developing, conserving and intelligently using non-human resources."
        (2) "Conserving; developing and intelligently using the natural resources."

    Why does (2) show the better concept? Note difference in punctuation.
    b. Criticizing the following lists as appropriate classifications of natural resources suitable for conservation study.
        (1) Soils, forests, wildlife, fish, birds, minerals, water, scenic and historic areas, highways, prairies.
        (2) Soils, vegetation, climate, people, water, deserts, minerals and wildlife.
        (3) Minerals, vegetation, air, sunlight, water, works of art.
    c. Explaining why production is more important than consumption in conservation. Under what conditions may saving paper lead to conservation practices? Under what conditions may saving paper be a negative factor in conservation?
    d. Defining these terms: devastation, substitution, controllable, natural balance, exploitation, liquidation, fund resource and climax vegetation.
    e. Explaining in what way the "balance of nature" is like a pendulum.
    f. Why is a severance tax justifiable?
    g. Which of these policies do you believe sound—raising fish in hatcheries, (1) to be used in restocking the same stream year after year, or (2) to be used in restocking a stream that is then managed so future restocking is unnecessary?

Chapter III

FITTING CONSERVATION INTO THE SCHOOL

PLANNING necessary. Since conservation may be a logical part of the instruction on different grade levels, and in several subjects, careful planning is necessary to assure an effective program. Such planning may involve most of an entire school system.

In too many schools conservation, if taught at all, has been taught by one or two science or social studies teachers. While better than none, instruction in one subject, biology for example, does not give students an adequate understanding of the relation of conservation of natural resources to other fields of subject matter such as geography and economics. Of more importance is the fact that students get an inadequate conception of the influence that the natural resources exert in each person's daily life. Moreover, unless the one or two teachers are teaching required courses not all students receive instruction in conservation.

This situation indicates the need for a careful consideration of conservation on the part of superintendents, principals, supervisors and curriculum directors as well as teachers. Conferences of teachers should include reports and discussions on the significance of conservation education, on progress made in other schools, on available and suitable materials for each phase of conservation, on concepts as distributed in scope and sequence charts and most important of all on the meaning and implications of conservation as a socio-economic policy.

In developing a program in conservation education for a school, it does not matter what the organization or type of school, there is some way or ways in which conservation can be taught in that school.

Plans compared. Several plans for teaching conservation of natural resources are presented here:

Plan 1. A separate course in conservation, either required or elective.

a. Taught by a specially trained teacher.

b. Taught cooperatively by several teachers.

Plan 2. Instruction through a core curriculum, conservation concepts taught in a variety of units, not as separate units on conservation.

Plan 3. Conservation units in standard subjects or courses.

Plan 4. Conservation taught incidentally in standard subjects or courses.

Plan 1-a—A separate course in conservation, either required or elective, taught by a specially trained teacher.

Advantages

1. Centralizes responsibility in one teacher.
2. The best qualified teacher in the school could be selected and given the opportunity to specialize.
3. Students would be more conservation-minded because of the importance given the subject when on a plane coordinate with other subjects.
4. Its vocational guidance value would be greater.
5. Some students who have little interest in other subjects could be interested in a properly taught course in conservation.

Disadvantages or Difficulties

1. Because of ramifications of conservation into many fields it would be difficult to get a well-qualified teacher.
2. The difficulty of scheduling a separate course in an already crowded schedule.
3. Unless made a required course all pupils would not be able to schedule it.

Plan 1-b—A separate course in conservation, either required or elective, taught cooperatively by several teachers.

Advantages

1. Same as 3, 4 and 5 under Plan 1-a.
2. Should provide enriched content and broader viewpoint for students.
3. Group planning of conservation course by teachers should have beneficial influence on the teaching of the regular subjects.

Disadvantages or Difficulties

1. Same as 2 and 3 under Plan 1-a.
2. Difficulty of scheduling the time of several teachers.
3. Difficulty of placing responsibility for the course and developing sustained pupil-interest with changing teachers.

Plan 2—Instruction through a core curriculum—conservation concepts taught in a variety of units, not as separate units on conservation.

Advantages

1. All pupils get instruction in conservation.
2. Cooperative planning by teachers is necessary.

Disadvantages or Difficulties

1. Difficulty of a reorganization of the school from the conventional subject curriculum.
2. Teachers in core curriculum are not likely to have much training or background in conservation.

Plan 3—Conservation units in standard subjects or courses.

Advantages

1. Responsibility is assigned.
2. Gives individual teachers an opportunity to develop strong units in conservation.
3. Avoids administrative problems.

Disadvantages or Difficulties

1. Possible lack of training and background in conservation of some teachers.

Plan 4—Conservation taught incidentally in standard subjects or courses.

Advantages

1. Same as 3 in Plan 1-b.
2. Same as 3 in Plan 3.

Disadvantages or Difficulties

1. Instruction in conservation likely to be nonexistent or ineffective.

Plans 2 and 3 appear to be the most adaptable and effective. Both of these are programs of integration. Several problems arising in integration of conservation into units and courses present themselves:

1. Into what subjects shall conservation be introduced?
   a. What phases of conservation shall be emphasized in each?

2. What special units on conservation should be developed?
   a. Shall separate units on each of the major resources be developed?
   b. Shall conservation units be organized on the vertical basis, i.e., with separate units on each of the major resources, soil, water, forests and grasses, wildlife and minerals, or on the horizontal basis, i.e., with separate units on such phases of conservation as use, inventory, renewal, substitution, protection, research, planning and cooperation or other basis?

3. Shall conservation be integrated into other units, and if so, into what units?

4. What shall be the objectives and content of conservation instruction on the various grade levels?

Integration of conservation in other units with no conservation units as such. For the lower elementary grades and even through the fifth the information about natural resources might well be integrated into the commonly taught units on the home, school, farm, Indians, Pilgrims and others. It is questionable whether the teacher should be concerned about the broader phases of conservation in the lower elementary grades. Ideas about use and protection of the natural resources should be taught as such. The term "conservation" should be avoided in the elementary school.

Nature study, elementary science, or social studies, whatever the course may be called, should develop the ideas of mutual helpfulness

and harmfulness, and an "awareness of" the resources along with an interest in the living things of the environment.

This same type of integration might be carried into the upper elementary grades. To do so would be at the risk of making conservation appear to be incidental. A more serious danger is that conservation might be neglected entirely. Hence, it is recommended that starting with the sixth grade there be at least one conservation unit in each grade, although it may not be so called.

A conservation unit for each of two or more subjects in one grade. This contemplates, for example, that in the eighth grade in each of several subjects — geography, history, civics and science — there would be a conservation unit. It would be necessary for teachers in such case to work together to secure a proper balance in the instruction.

One conservation unit in one subject for each grade. This means, for example, teaching a conservation unit in geography in the sixth grade, a conservation unit in history in the seventh and one in science in the eighth. Variations of this order of subjects may be desirable. This plan has the advantage of permitting the development of more comprehensive units, avoiding duplication within short space of time yet serving as a review or recall from the previous year's work. The biggest advantage would probably be the simplicity of organization. With this organization the conservation unit of the eighth grade might well be a problem centering on the major natural resource of the region. The other resources would all be brought in as the unit developed.

Separate units on each of the major resources. For example, in geography there would be a unit on water, a unit on forests, another on wildlife and on each of the other resources. This organization has the disadvantage of inducing development of small units and carries the danger of much overlapping. Furthermore, it has the serious disadvantage of separating these closely interrelated resources. A study

of conservation should integrate the resources in the student's mind rather than segregate them. They are a part of a whole, are interdependent and should be so taught and so understood.

Setting up the teaching of conservation on horizontal basis. A common procedure and probably the easiest has been to teach a unit on soils, a unit on forests and a unit on each of the other natural resources. Even though all the resources may have been included in a single unit, the unit has frequently been broken down according to the different resources. An enterprising teacher will develop units for the different grade levels on some phase or phases of conservation (see page 31) that applies to all resources. Many teachers now organize content according to functions or persistent problems. The same organization is applicable for teaching conservation because natural resources are interlocked and interrelated.

The primary conservation activities can be used as the horizontal phases or unifying themes. They cut across all the resources.

Applying the idea of horizontal organization in nature study, a teacher, for example, would stress *use* and *protection* as the central ideas in a study of wildlife in the first grade; of plant life as the theme for the second grade; of water for the third; of soils for the fourth; and of minerals for the fifth.

In the upper elementary grades all the phases — inventory, use, protection, substitution and renewal — can be developed to some degree. The units in the upper grades may well be given a broad title of the problem type with the term "conservation" included. The students should be taught to recognize the five primary phases and the teaching should treat of use of one resource as it affects the use of the others, of protection of one resource as it affects the protection of the others and similarly with the other phases of conservation. The teacher should also develop an understanding of the ways in which the use of each resource affects the use, renewal and protection of the other resources. Put the emphasis on relationships and interdependence of the resources. Conservation in the final analysis

depends upon working with the entire environment, not just one or two resources.

The contributing phases of cooperation may be developed from the first grade to the twelfth starting with the ways common things in nature are of benefit to each other, gradually expanding to a consideration of the ways by which society's and the individual's interests are attained through cooperation in the management of natural resources.

Different phases of use are adapted to different grade levels. Starting with the simpler uses in the home and in play for the lower grades, use in commerce, employment and the possibilities of new uses developed as a result of research may be emphasized in the upper grades. Renewal may be treated on various levels from the simple observations about seeds in the lower grades to the intricate questions of control of production and "sustained yield" in the senior high school.

Santa Barbara (California) City Schools

Studying soils and the soil holding powers of plants.

SOME SPECIAL CONSIDERATIONS FOR THE TEACHER OF A ONE ROOM SCHOOL

A conservation unit in which all grades participate. A fine example of this organization is the work done by a teacher in California. The unit was launched as work for certain combined grades, but the interest spread until finally all grades were participating. The major activity was the building of a model forest ranger station. Suitable activities were found for all ages. Correlations were made with the different tool subjects.

No doubt this procedure is highly desirable. It requires much planning and skillful teaching. It cannot be recommended as the most practical for all schools.

A unit for each grade. This differs from the preceding organization only in the degree of relationship between the units of the different grades. If in actual practice all pupils in the school were engaged in the activity program during the same periods, there would be no difference except in the teacher's planning. It is possible that even with different units being taught in different grades, the activities being carried on by the first grade and those by the eighth would be no more diverse than if both were working on different phases of the same unit. This is due partly to the fact that the study of the natural resources resolves into a radiating pattern as a result of the interdependence of the resources.

A unit for each grade appears to be a simpler organization than a unit for all grades. The planning and discussion groups would be easier to handle effectively when made up of pupils of one grade level.

A unit for two grades. There is a possibility of grouping two or three grades for the study of one unit as a middle ground procedure. This would have the advantage of providing larger groups for discussion than the second type of organization and avoiding the

extremes of interests and abilities of the first. The teacher would probably have fewer "irons in the fire" than in either of the first two set-ups.

ACTIVITIES

1. Give reasons why the teaching of conservation has not progressed more rapidly.
2. Indicate which of the following you believe most effective:
   a. incorporating conservation in textbooks.
   b. developing conservation as a part of new courses of study.
   c. special training of teachers in conservation education.
   Why are all three necessary in a good program?
3. Give reasons why the lower grades (1-5) are of less importance in a conservation education program than the senior high school.
4. Point out the disadvantages of having units entitled conservation in several subjects in one grade, in having a unit so designated in one of the lower grades.
5. Develop an outline to show how conservation concepts may be developed in a unit on Indians.
6. What is meant by the horizontal organization in teaching conservation?
7. State the values to a teacher in recognizing the horizontal organization of conservation material.
8. Examine a course of study outline, checking those items you consider as conservation. Select units that might easily be revamped into conservation units. Add items to existing units that will aid in developing conservation concepts.
9. Decide which plan on pages 39 and 40 would be best for your school.

Chapter IV

ADAPTING THE TEACHING TO STUDENT GROUPS

PEOPLE and conservation. In planning and carrying out a program of conservation education recognition should be given to the different adult groups represented by the students. We should recognize two main groups, (1) those engaged in primary industries and (2) those engaged in other occupations which for convenience we shall call the secondary industries. Although this grouping is not hard and fast, it will help point the instruction along certain lines.

Significant differences in rural and urban schools. Teachers in small town and rural schools should be conscious that many of their students represent and later as adults will be in the primary industries group. Such teachers should take advantage of their environment and use many real conservation activities in their teaching. Teachers in urban schools should realize that most of their students now represent and as adults will be in the secondary industries group. Urban teachers may not have opportunities to have their students do as much conservation work as rural and small town teachers but the students should be taken out-of-doors where they come into contact with natural resources and can see the results of conservation practices and be made to realize how their own lives are affected.

The primary industries group. In this group are farmers, miners, trappers, fishermen, foresters, loggers and others in similar and closely allied occupations. This group, including their families, comprises about one-third of our population. Obviously these people exert a very direct influence on what happens to the natural resources for they are constantly working with the resources. Their livelihood

is directly dependent upon the productivity of the resources. Some abuse the natural resources either in ignorance or because they are not in a position financially to make the initial investment in conservation practices. In many cases the margin between their costs of production and their income causes them to disregard the future of the resource. Naturally they buy food and clothing first. Many times there is nothing left with which to protect or improve the natural resource.

Two subgroups should be recognized — the owners of the resources and the operators or employees. In many cases the owners are also the operators. A resource owner is in a more responsible position with respect to the resource than is the operator or employee, for the owner decides what is to be done and how it is to be done.

The secondary industries group. In this group is found about two-thirds of our population. It is largely urban and is composed of business and professional people, industrial workers and others. Many of these people are so far removed from the natural resources that they have little idea of conservation or of the significance of the natural resources in their lives. This lack of contact with and appreciation of natural resources makes conservation education doubly important for them.

Education for the primary industries group. Education in conservation for the one-third of our people who depend directly upon the natural resources for a living may be approached from the standpoint of personal interests. Attitudes are important, of course, but of more importance is specific training to develop "know-how," habits and skills in actual work with the resources. The farmer needs to know how to prevent erosion and maintain soil fertility. The farmer woodland owner has to know which trees to cut for fuel, which for pulp, which for timber, which land to reforest and which to use as open pasture or for other crops. The persons who are responsible for our fish and game have to know how to manage these resources. Those in the primary industries need to develop habits,

skills and abilities, backed by understanding and attitudes. These people on the land need training in the persistent problems of "earning a living" and how to do so without destroying the basic resources. It takes a more capable person to conserve than to liquidate.

A course such as vocational agriculture in which learning is based on doing is the most effective type of conservation education for those who are dealing or will eventually deal directly with the resources. Such courses preceded or paralleled by a study of conservation in other subjects in classes with students whose interests differ is highly desirable.

Many of this first group do not stay in school long enough to reach the high school level where they may study vocational agriculture and other subjects in which they may acquire functional understanding of conservation. This suggests that in those schools where drop-outs commonly occur before the ninth grade, conservation

Every vocational agriculture school in Georgia has a school forest. They range in size from five acres to six hundred acres.

should be taught in terms of the practical problems of the student's daily life and probable future needs before the drop-out point is reached. Students should be urged to join youth organizations interested in conservation. *The fact that many cannot be adequately trained before they quit school points to the need of classes in conservation for out-of-school youth and for adults.*

Education for the secondary industries group. For most of this group education in the conservation of natural resources should primarily develop attitudes rather than "know-how." However, those who use the woods, fields and streams for recreation should know the students' outdoor creed (page 113) and put it into practice. Those who never get off the city pavement need an understanding of the fundamental place of natural resources in their daily affairs. Because of their numbers the attitudes of this group may be as important as the "know-how" of those in the primary industries.

Urban schools should not overlook the potentialities in classes for adults on conservation problems.

Conservation education for this large group should develop those attitudes and understandings that every good citizen should have in order that he may properly support or censure what certain agencies and owners do with the natural resources, and so he as a citizen will realize what cooperation there should be between the state and the private individual who owns some of these resources.

ACTIVITIES

1. List the primary industries and a secondary industry closely related to each primary industry. Designate the primary industries in your community.
2. Classify as either primary or secondary the following occupations: hardware dealer, oil-well driller, assayist, forest ranger, manager of a farmers' cooperative elevator, railway engineer, school teaching, banking, trapping.

3. List in order the industries handling wheat and wheat products starting with the farmer. How does the bread eater in the city affect what the farmer does to his soil?

4. Assume that you are a school superintendent or principal with 100 students in high school. List reasons why you would or would not advocate a school forest to be cared for largely by students. Do same for a high school of 500 students; of 1,000 students.

5. Give your interpretation of the significance of this statement made by a conservationist: "Many acres of immature forest are cut each year because people cannot eat trees."

6. Make a list of students of your acquaintance who you believe will enter primary industries.

7. Develop an outline that you believe suitable for a course in conservation of natural resources for adults in your community.

8. List in order of importance for persons in the primary industries, the following as objectives for instruction in conservation: attitudes about conservation, manual skills in carrying out conservation practices, know-how to manage natural resources, information about conservation of natural resources. Do the same for the secondary industries group.

Chapter V

RELATING CONSERVATION TO SCHOOL SUBJECTS

RELATION to nature study. Conservation and nature study are synonymous to many persons. Nature study has values apart from the teaching of conservation concepts. To attempt to make all nature study meet the specifications of conservation would be unwise. It would be more logical to look upon nature study as one of those subjects in which conservation concepts may readily be taught. Elementary conservation concepts of mutual helpfulness or protection may be developed in nature study in the lower grades. Nature study should provide a child with an interest in nature and with attitudes that will enable him to get more important conservation understandings out of subsequent subjects. Each year the pupil should be given instruction in an increasing number of forms and examples of interdependence and competition.

Some conservationists have questioned whether nature study, or elementary science as commonly taught develops any of the major conservation concepts sufficiently to justify calling such study conservation education. Their criticism has been that a great part of nature study, as so frequently taught, deals with individual species of plants and animals as separate and isolated information. Time has been spent studying some exotic insect of no local significance when a study of an insect that plays a part in the destruction or production of some locally important resource would be far more valuable. Often the fundamental principle of conservation, natural balance or interdependence, has been neglected. There certainly is just grounds for not designating such nature study as conservation education. The study of unrelated species is not the best nature study and has little significance in developing conservation concepts.

The teacher who creates pupil interest in the things of nature and emphasizes interdependence is making a major contribution to conservation education. The more complex principles of conservation can be developed in later years.

Whether or not we recognize the instruction at the lower elementary level as conservation education is relatively unimportant. Whether or not the teacher develops interest and the rudiments of use, protection and interdependence of things in the child's environment is important. Nature study so taught is good nature study and also training in conservation.

It is not important that the child use the term "conservation" until later than his nature study course. Instead, simpler terms such as "protecting," "helping," "planting," "feeding" should be used. Some teachers claim that the term "conservation" can be used as

Tennessee Department of Conservation

Teaching students to educate others is an important element of conservation education. This girl has the responsibility of protection.

early as the second or third grade. The author is of the opinion that those teachers are not fully aware of the complexity of the conservation concept and that the eighth grade would be a better time for its introduction.

Some of the newer elementary science books present the idea of interdependence of things in nature in simple terms. If with this improvement in teaching material, the teachers of nature study can be given a better understanding of what conservation means, then nature study will certainly contribute much to the program of conservation education.

Biology. Less emphasis is needed on morphology in biology and more on food chains, plant and animal ecology and on reproduction and population factors. Identification of birds may be just identification and nothing more, or it may be the basis of scientific observation of a condition of nature fundamental to conservation or it may lead to a strong feeling of protection and injudicious feeding that does more harm than good.

Tree identification and photosynthesis discussed in their relation to forest management constitute conservation teaching. The discussion in the abstract of these same topics does not constitute conservation teaching.

One of the important contributions of biology to conservation is a realization of the fact that nature, sometimes sentimentally called "Mother Nature," often is not motherly. Nature is harsh in maintaining what is called "natural balance"; she provides predators as well as prey. Biology should reveal the important understanding that predators are not necessarily bad. After all man is a predator.

The most important process in the plant world, photosynthesis,[1] becomes more meaningful if the student sees it in relation to natural resources. Photosynthesis is a principal factor in the struggle for existence among plants of a species in an otherwise similar environment. The fight for light, the energy source in photosynthesis, makes

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[1] The New York Botanical Gardens has produced an excellent animated color moving picture film entitled, *The Gift of Green* which deals with this life process.

the straight tall valuable forest tree, and means death to the weaklings. It is one of the principal factors that determines what plants shall succeed each other on an area and what shall be the climax type of plant. The fight for light must be uppermost in the forester's mind when trees are removed from the forest lest too much or too little light be admitted for the proper development of a desired and valuable species of tree.

The physiology of reproduction may be used as a lead to the study of animal population, an area of study replete with conservation problems involving habitat, protection, food, predators and the prevalance of disease and parasites. Population in turn affects these factors so that a natural balance is maintained. Conservation of wildlife is especially dependent on an understanding of these relationships. The question is not always how more of some wildlife

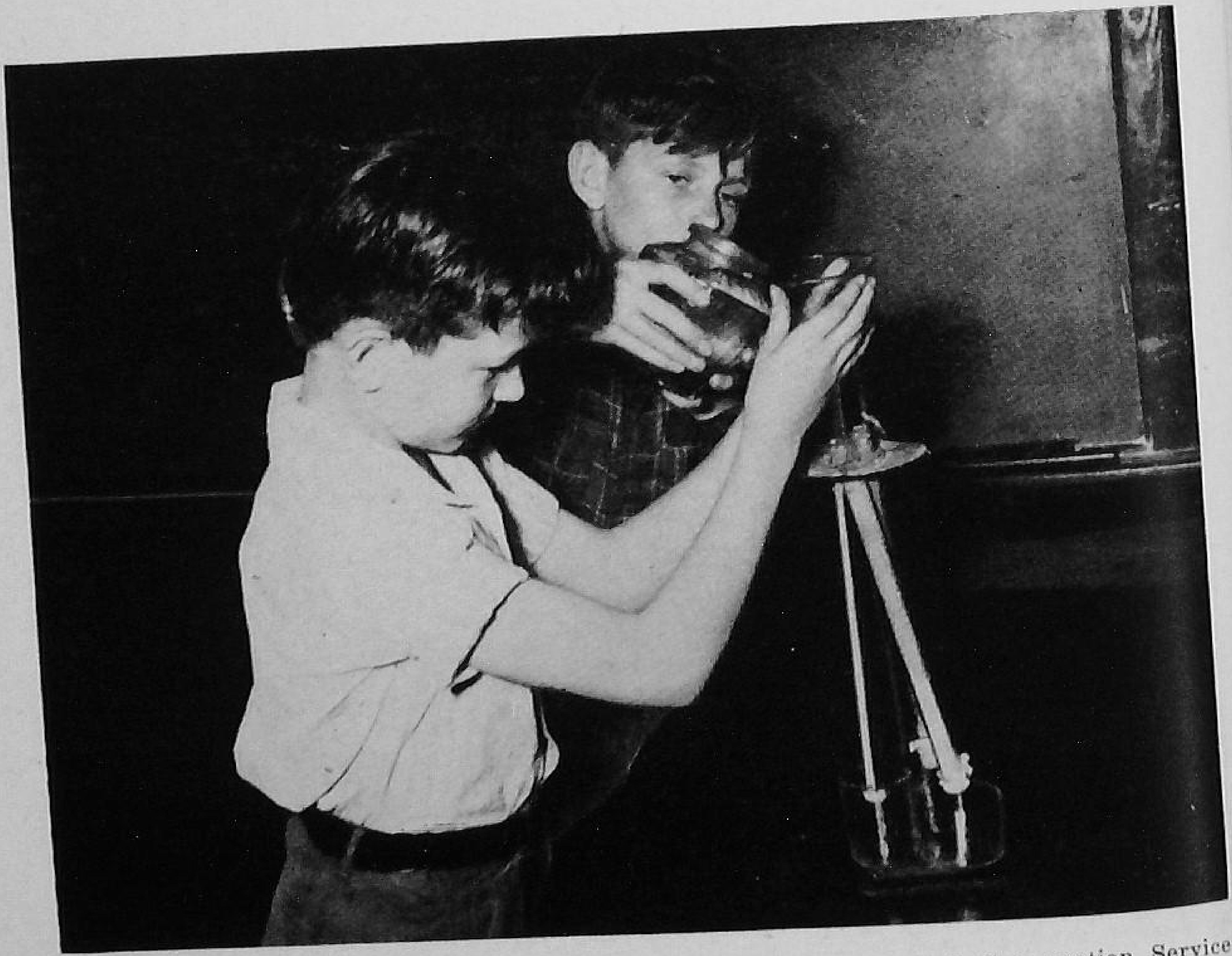
U. S. Fish and Wildlife Service

Snow geese on their refuge at Sacramento, California.

can be maintained nor how population of other forms can be reduced. It is rather how many of each should be maintained for greatest productivity of an area.

Insects are a continual threat to human existence. Naming their mouth parts is insignificant in understanding their place in the balance of nature, or the conditions that lead to an epidemic and the factors that operate to check the epidemic. An understanding of these conditions may be more important than to know a formula for an insecticide. A knowledge of these factors may reveal the importance of maintaining certain seemingly unimportant or apparently harmful species of animal.

Relation to physical sciences. Chemistry has continuously opened the door to new uses of natural resources. Some new processes have



Soil Conservation Service

Two seventh-grade boys discover by a simple experiment that soils differ in their capacities to absorb and hold water.

promoted conservation, others have interfered with conservation. Chemistry has made it possible to use resources that were formerly unavailable. It has helped in the recovery and protection of resources. Chemistry has contributed to new resource uses and in so doing has contributed to and also interfered with conservation. It has been a blessing when new uses for waste products were developed or more efficient methods of production or protection were found. It has interfered with conservation when chemical processes have resulted in the dumping of poisonous substances into streams killing vegetation and aquatic life or when gases so polluted the air that vegetation and animal life were destroyed in the area. Can chemical research find the best use for all resources without the devastation of any?

The substitution of chemical solutions for soil in plant production has led some people to believe that our food supply may some day be produced without soil and, therefore, that soil conservation is unimportant. Plants grown in solution need the same plant foods as do plants grown in soil. Synthetic food products must also contain the same mineral elements that crops get from soils. There are, of course, deposits of phosphates and other plant food elements that may be used for the production of tank crops or synthetic foods. But these deposits like soil are exhaustible.

Chemistry may change the pattern but not the need for conservation. An understanding of the interdependence of natural resources reveals the fallacy in the belief that short cuts in food production make conservation unimportant.

Units on fire, fuel or combustion may well develop certain conservation concepts. Teaching such units without considering the destructiveness of forest and grass fires, how they are started, how the conditions of slope, humidity, velocity and direction of wind and nature of fuel affect the rate of burning and damage, is neglecting to make an important application of scientific principles to the problems of conservation. The differences in the use and management of renewable and nonrenewable fuels should also be considered.

The laws of indestructibility of matter and energy may appear to deny the need of conservation. It must be borne in mind, however, that matter and energy may become unavailable for man's use. Keeping matter and energy in available forms and in available places is conservation.[2] It is important to teach the law of indestructibility of matter but it is also important to teach that matter and energy may become unavailable to man and so, for practical purposes, destroyed.

Relation to science as a whole. The practice of conservation depends primarily on scientific information. Before a forest is cut, a dam built or a swamp drained, it is necessary to know what the results will be. Many so-called conservation projects have been disastrous failures because someone did not have all the scientific facts he needed.

Conservation may be likened unto a tree with its roots struck deep in the facts of science and its branches reaching up into the realm of the social.

Relation to social studies. Man is continuously adjusting to and changing his environment. He cannot prevent the wind from blowing, gravity from acting nor the sun from shining. He can, however, manage the natural resources so the forces work to his advantage or do the least harm. The mutual impacts between man and the natural resources make conservation an important phase of social study. According to Dr. George T. Renner of Columbia University, physical geographers and geologists laid the foundations for conservation education.

Geographers have for years been teaching conservation without much publicity. Geography, being a study in human ecology, is

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[2]Atomic scientists tell us of the almost unbelievable amount of energy that may be released by splitting atoms and that matter and energy are really the same thing. The destructiveness of unharnessed atom splitting as in the atomic bomb has grave implications as to what may happen to natural resources. The devastation of large areas by many atomic bombs may cause serious disturbance of the natural balance on a nation-wide basis.

uniquely adapted for teaching conservation. Geography describes, classifies and inventories the natural resources and their uses. All these activities are phases of conservation. Transportation, communication, commerce—major phases of geography—likewise play an important part in the way the different resources are used.

Economics and sociology provide opportunity for the development of conservation concepts. The standards of living in a region are dependent upon the use of the resources which in turn are dependent on the abilities of the people, the quantity, quality and availability of the resources. The fact that the public has a stake in the natural resources as well as the private owner, creates a social problem.

History is largely the story of man's efforts to get and to hold natural resources. The longevity of nations, the extent of their natural resources and the way they managed their resources are

Soil Conservation Service

A teacher explains the seriousness of gullies caused by erosion.

closely related. War should be studied from the natural resource standpoint. In war we dig our mines deeper and pump our oil faster. We scatter our metals in desert, jungle, and on the bottom of the sea. We cut our forests more ruthlessly. We overgraze our grasslands. Because bigger crops are needed and some important fertilizer materials are not available in sufficient quantities, soil fertility is reduced. Activities such as saving fuel and gathering scrap iron are commonly described, especially in war periods, as conservation. They should be recognized rather as war economies necessary because natural resources are already being drawn upon at a rate limited only by the available transportation or manpower. Despite these so-called "conservation" activities the natural resources may suffer devastating use.

In total war, the total resources of one side are pitted against those of the other. As war progresses the resources of the belligerents are drawn upon more and more. Eventually the time comes when, because of physical limitations of natural resources and manpower, production on one side reaches its upper limit and then falls off in a vicious downward spiral of decreased production. (Reduced civilian manpower, because of the drain to military forces, and because of lowered living standards, produces less and less of vital war materials.) Because of this decrease in production of vital war material, the fighting machine becomes less and less effective. The war is thus won, assuming equal fighting ability, by the side whose productivity is greater, and whose reservoir of resources, human and natural, can last the longer.

The side whose resources, after cessation of fighting, are still more productive, is in the better position to win the peace.

Fortunately, the United States put into effect some major conservation measures in the years prior to World War II. Although we had only made a good start in building up our soil, restoring forests, regrassing ranges, providing control of oil production, restocking wildlife reserves and providing water behind immense dams for power and irrigation we drew heavily for food, oil, lumber, power

and other materials from these reservoirs and out-produced our enemies.

Relation to health education. Among the natural resources, soil and water play the most important role in health. When an area is set aside for watershed purposes, conservation practice decrees that certain other uses must give way. Proper treatment of forests and vegetation on watersheds results in clearer, purer water. It has been found that water seeping through forest vegetation and litter on the forest floor acquires desirable constituents, loses impurities, and is kept clear. Where soil is not protected by vegetation, water draining from it is more likely to be cloudy and polluted.

Some soils are deficient in certain elements. Foodstuffs grown on such soils, unless supplemented by other foods, cause dietary troubles and ill health. Proper soil management and maintenance of soil fertility thus have a bearing on health.

Forests with their pure air and their more constant temperature have contributed to the health of many people.

Just as conservation makes a positive contribution to health so failure to practice conservation leads to ill health and bodily harm. Failure to properly manage national resources has resulted in forest fires, floods and dust storms, which have taken lives, and injured the health of many persons.

An understanding of the relation of health to the conservation of natural resources may be developed through such units as "camping along a forest stream," "studying our water supply," "living in the out-of-doors."

Students should develop an understanding of the interdependence of the human and natural resources—that conservation of the one is inevitably linked with conservation of the other.

Although our health is directly affected by what happens to the natural resources and, therefore, health education and education for the conservation of natural resources are related and overlap here and there, they should not be confused. There are some distinct

differences that indicate that attempts to include both in the same category is poor educational organization. Both fields are so broad and many phases of each are without relation to many phases of the other that an attempt to teach them as one area or function is likely to jeopardize the effectiveness of the teaching in both.

The objectives of health education or any other phase of conservation of human resources for most people are primarily habits and secondarily attitudes, while in education for the conservation of natural resources, the objectives are primarily attitudes and secondarily habits. Every person may be expected to have a first-hand active interest in his health in such persistent personal problems as: "How can I attain better health?" or "How can I avoid injury to my body?"

Conservation of natural resources, on the other hand, is unfortunately an impersonal problem for the majority of people who have no daily contact with natural resources.

Relation to recreation. From an educational standpoint as well as from a resource standpoint, recreation and health education are very similar. Health and recreation depend on the same resources and in much the same way. Water is one of the major requirements of a recreation area. To be suitable for recreation, water must not be polluted. Forests and water are one of the ideal recreational combinations. Forest water meets the requirements of clarity, constancy and purity. Forests, too, have scenic values, they are quiet and provide the lure of the unknown. The variety of forest wildlife completes the recreation site. All this means that forest areas used for recreation must have protection and limited use for other purposes.

From these facts it may be seen that certain study units may be developed to bring out common learnings with respect to conservation, health, recreation and safety. It should be recognized, however, that some study units need to be developed in the distinct sphere of each of these areas.

Relation to the tool subjects. In comparison to some other subjects, arithmetic is not well adapted to teaching conservation, although many phases of conservation, such as resource inventory, amount of use and amount of waste involve arithmetic. Significant problems may be developed in these areas but their value in teaching conservation should not be overrated.

One might expect that some excellent problems could be developed on how long our various resources may last. Problems of this type are not only theoretical but may be misleading. Emphasis is put on the future, tending to delay action when we are already in the midst of the difficulties of devastation and liquidation of natural resources.

In arithmetic the process is more important than whether the problem is about soil, trees, deer or fish. Merely to work problems in cords of wood or acres of land may give no understanding of forest land management. To be most effective major points of significance must be developed, too. The arithmetic phases of conservation might better be taught in geography, science and other studies, bringing arithmetic to conservation rather than trying to teach conservation in arithmetic. The challenge exists for development of instructional materials in mathematical phases of conservation that will really be effective in developing conservation concepts.

Language arts provide many opportunities for teaching conservation. Comprehension is one of the major objectives in reading. Some recently published readers provide information regarding conservation of natural resources. Accurate expression is one of the objectives of composition. Students will find the field of conservation a rich source of subject matter for oral or written composition. This field is rich in debate questions, report and discussion topics and in possibilities for dramatization.

Poems about trees, birds, flowers, waters, soil and wildlife should not be emphasized so much that the sentimental aspects distort judgment which is necessary in the practical execution of conservation. Even though sentimentalism has furnished the impelling motive for

real conservation in some cases, in others it has interfered with the carrying out of conservation measures.

Spelling words relating to conservation is valuable if combined with defining or explaining their meanings.

ACTIVITIES

1. Develop a lesson plan in nature study on the honey bee with the objective of teaching mutual helpfulness.
2. List reasons why nature study, elementary science and biology do not usually develop conservation concepts.
3. Tell how we capture the sun's energy for future use and what that has to do with conservation.
4. Tell how we now recover some of the plant food from the sea.
5. Make a list of insects and classify as helpful and harmful. Are there any that are totally harmful?
6. Read about synthetic foods and hydroponics. Of what significance are these to maintenance of soil fertility?
7. Debate whether atom splitting will contribute to or retard conservation of natural resources. What about widespread use of DDT?
8. List conservation concepts that may be taught in physics, chemistry and history.
9. Examine textbooks on various subjects, marking parts that pertain to conservation.
10. Make a list of topics dealing with conservation for oral English.
11. Make a diagram showing how conservation ties natural science and the social studies together.

12. Make lists of words relating to conservation suitable for spelling at different grade levels.

13. Put some good books on conservation on the required reading list.

14. Indicate on a map of the United States the areas in which certain conservation problems exist.

Chapter VI

CONSERVATION EDUCATION AND THE MODERN CURRICULUM

As pointed out in the previous chapter, the teaching of conservation is facilitated by the modern programs of instruction, embodying fusion or a social studies core. Conservation is also readily adaptable to grade combinations and alternations.

A simple yet comprehensive plan for teaching conservation of the natural resources is presented here.

Grades 1-5, Nature Study, Elementary Science, Social Studies or Core Curriculum. Integrate in regular units. Emphasize protection and use of natural resources in the home and in play, mutual helpfulness and harmfulness in nature. Avoid assigning of emotions to plants and of high human emotions to animals.

Grade 6, Science or Core Curriculum. Use special unit on conserving natural resources. Emphasize what the resources are, how they vary, where found, how nature renews, how man uses and provides for renewal of natural resources. Phases[1]—renewal, inventory, use, protection.

Grade 7, Geography or Core Curriculum. Use special unit on conserving natural resources. Emphasize how man uses natural resources in his daily work, how they affect his way of living, relation to commerce, transportation and other activities, how other countries have conserved or destroyed their natural resources. Phases—use, inventory, renewal, protection.

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[1]Phases of conservation are listed in this outline in the approximate order of importance for the grade.

Grade 8, History or Core Curriculum. Use special unit on conservation of natural resources. Emphasize how pioneers used the resources, avoiding censure of pioneers. The history of lumbering, mining, and other primary industries. The story of depletion, search for, moving to and developing new resources. Phases—use, inventory, protection, renewal.

Grade 9, Science or Core Curriculum. Use special unit on the major natural resource of the locality. Emphasize how the proper use of this resource depends on and affects the other resources, good and bad methods of managing this resource, why they are good or bad, application of science in perpetuating the resource. Phases—research, renewal, protection, use, inventory.

High School subjects. *Biology* — Use special unit at the beginning to set up the theme for the course or at the end to coordinate and

Soil Conservation Service

Healing of eroded land is studied by fifth-graders and their teacher.

apply the learnings of the course. The whole course may be presented from the standpoint of conservation. Emphasize a local problem in wildlife management; natural balance and interdependence including population cycles, food chains, prey and predators; plants, soil, water and wildlife as major factors of environment. Phases—renewal, use, protection, inventory, cooperation, research, planning.

Chemistry — Use special unit and integration in other units. Emphasize new uses, elimination of waste, industrial processes destructive to other resources through pollution, proper waste disposal. Phases—research, use, protection, renewal, substitution.

American History — Use special unit which develops the story of the rise of the conservation movement, also integrate in other units the ways in which abundance or scarcity of natural resources influenced events and movements from the Mayflower to the present.

U. S. Forest Service

Instructions on how to plant trees are given by farm forester.

Point out contribution of conservation efforts in the 1930's to the winning of World War II. Compare what happened to natural resources in World War I with World War II. Emphasize changing attitudes concerning abuse of natural resources, how communities degenerate, effects of submarginal lands, changes in land-use policies. Phases—use, protection, renewal, inventory, substitution, cooperation, planning.

Sociology — Use special unit developing the idea of man's dependence on the natural resources. Emphasize man's use of natural resources as determining his standards of living: man a tenant of nature, changing uses, results of ignorance and intelligence in the use of natural resources, why the "lower one-third," "rural slums," the "have-not" nations as causes of war, population pressures in resource-poor areas. Phases—use, cooperation, planning, protection, renewal, research.

Modern Problems or Civics — Use special unit on conservation in a democracy. Emphasize and define the phases of conservation, the ramifications (local, state, regional, national and international) of natural resource policies, problems of public and private responsibility, control of production, possibilities in new uses, the causes of devastation, the need for laws and regulations, ideas of primary and secondary land uses. Phases—cooperation, planning, inventory, research, use, renewal, protection, substitution.

UNDERSTANDINGS IN CONSERVATION FOR THE CORE CURRICULUM IN THE HIGH SCHOOL

Broad understandings in conservation related to basic functions of living:

1. **Conserving human resources.** Understanding that:
   a. Forest fires, floods and dust storms destroy human lives and property.

b. Fertile soil, pure water, forests, minerals and wildlife are necessary to insure abundant food, water and shelter.

c. Government agencies managing natural resources must consider the people living on the lands.

2. **Conserving our natural resources.** Understanding that:

a. Conservation consists of

(1) *Use* — (*a*) Conservation means wise use of natural resources. (*b*) We are and always will be dependent upon natural resources. (*c*) Resources have value only as man uses them.

(2) *Inventory*—The abundance, availability and quality of resources influence the way we live.

(3) *Protection*—Man must aid in maintaining a natural balance by protecting resources.

(4) *Renewal or development*—Forests, water, wildlife and soils are renewable resources, minerals are non-renewable or fund resources.

(5) *Research*—Scientific principles and techniques are necessary in conserving our natural resources.

(6) *Substitution*—Certain scientific developments, such as synthetic materials, complicate the problem of conservation of natural resources.

(7) *Cooperation*—Cooperative enterprises in conservation of natural resources bring communities closer together.

(8) *Planning*—Conservation projects must be carefully planned.

3. **Producing, distributing and consuming goods and services.** Understanding that:

a. All production is dependent upon natural resources.

b. Whether or not production is conservation or wasteful exploitation depends primarily on what happens to the land.

c. The natural resources have determined the settlement and development of new lands.

d. People of earlier and simpler cultures, having but crude tools, used such small amounts of the resources that they did not destroy the natural balance.

e. Mass production, made possible by scientific techniques, has caused ruthless exploitation of our natural resources.

f. Our great industrial centers have developed near abundant supplies of natural resources.

g. Lack of long time planning in using natural resources has led to waste, local depletion and economic crisis.

h. The application of scientific principles and techniques in production and distribution makes possible continuing production.

i. The natural resources of every area should be inventoried as to location, quantity, quality and accessibility.

j. Great consumer demands and costs of distribution contribute to wasteful exploitation only when they induce destructive production methods.

4. **Communicating.** Understanding that:

a. The use of modern means of communication — radio, press, motion picture and mail — are used to further a program of wise use of our resources.

b. Modern means of communication are being utilized in the conservation activities.

c. Natural resources reflected in literature, music and art enable us to communicate our thoughts to others.

d. Natural resources supply materials for communication systems.

5. **Transporting.** Understanding that:

a. Materials for and of transportation are derived from our natural resources.

b. Conservation of natural resources results in a steady flow of cargo, provides dependable power and keeps rivers navigable.

c. Modern means of transportation have developed as a result of the need for distributing products of the natural resources.

d. Modern and ample transportation has in turn made possible great industries which make constant demands upon our resources.

e. Modern transportation has made available many resources formerly denied some groups.

f. Transportation has enlarged the unit area of conservation making possible renewal in some areas while use is going on in others.

6. **Recreating and playing.** Understanding that:

a. Our natural resources provide us with varied recreation areas and materials of play.

b. The natural resources of a community, state or nation determine the types of recreation.

c. National parks and forests are accessible for recreation in many parts of the country.

d. Conservation measures applied to certain uses of natural resources increase recreation possibilities.

e. Everyday experience with and increasing knowledge of our natural resources contributes to recreation.

7. **Expressing and satisfying spiritual and aesthetic impulses.** Understanding that:

a. The beauty in natural resources provides pleasure.

b. The natural resources of a region often influence its literature, art, music and poetry.

c. We have a responsibility in preserving our heritage of beauty.

d. The natural resources of environments have influenced religious beliefs.

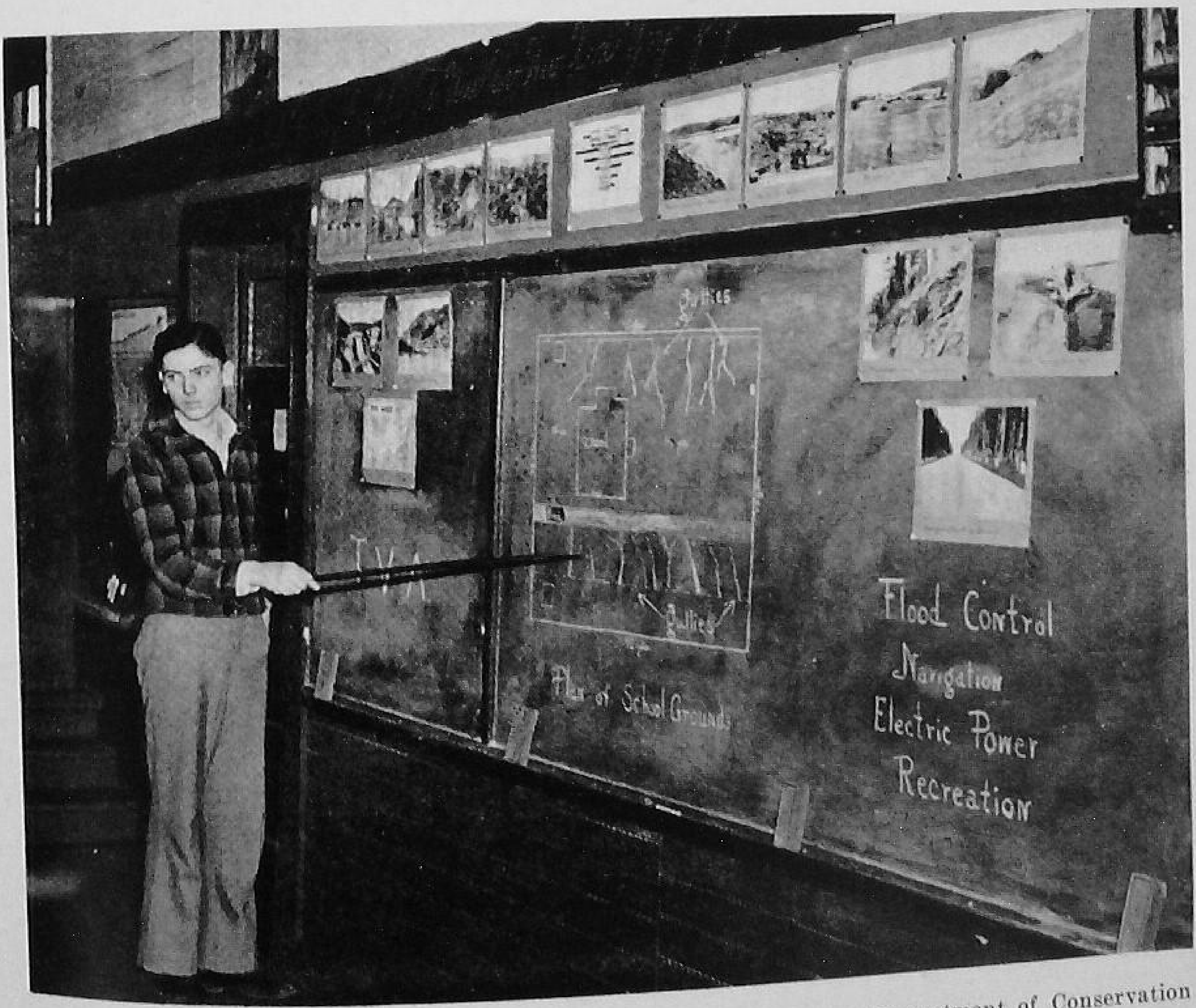
e. Many religious ceremonies of earlier peoples were centered around the use or preservation of some natural resource.

8. **Organizing and governing.** Understanding that:

a. The most effective plan of conservation requires cooperative action.

b. Federal and state governments are sponsoring conservation of natural resources.

c. Various governmental agencies are charged with the conservation of certain resources.



Tennessee Department of Conservation

Classroom study and planning precede actual work of erosion control.

d. Stability of governments has been in proportion to conservation of natural resources.

9. **Providing for education.** Understanding that:
   a. Our government is encouraging the training of future conservation leaders.
   b. An appreciation of the meaning and significance of conservation can be developed in our schools.
   c. Valuable conservation activities can be carried on in our schools.
   d. The spread of conservation information is the responsibility of every individual.

A West Virginia Unit. An abstract from *West Virginia Units in Conservation* is given here as an example of a well-organized unit. Note the following about this unit:

It includes definite information.

Specific references to the regular course of study are given.

Major points stand out.

The so-called "horizontal treatment" is used — that is, all resources are tied together and to the welfare of the state.

Wise Use of Our Renewable Natural Resources

Grades Seven and Eight

Foreword

This unit is a supplement to the Geography courses, pages 409-411, and to the Science course, pages 307-309, 310-311 in the "Program of Study for Elementary Schools." It is built around forests and soil with their dependent industries, lumbering, coal mining and agriculture. . . . The teacher's attention is directed to the importance of keeping before the students the surface areas, the watersheds and the natural resource areas of our state. . . .

I. General Objective:

To understand and appreciate the immediate necessity of making wise use of our renewable natural resources.

II. Specific Aims:

1. To appreciate the fact that the kind and slope of soil determine whether land should be used for agriculture or forests.

2. To appreciate to what extent the forests of West Virginia have been depleted and how wise land-use, reforestation, prevention of forest fires and public control will meet this immediate problem.

3. To understand how government can help us to use our renewable natural resources wisely.

4. To appreciate that West Virginia has much potential wildlife area, land which can sustain deer, grouse, quail, turkey, beaver, rabbit, bear and other species—to learn how individuals may use them.

5. To appreciate the length of time it takes to produce good soil and the speed with which it can be lost by erosion processes.

III. Suggested Outline of Study:

First Picture or Situation

Let us see what the early pioneer found in this land now called West Virginia. The mountains and the Allegheny Plateau, because of the climate and soil, were covered with families of trees—the century-old adults, the middle-aged ones, the saplings, the seedlings, all virgin forests which were constantly renewing themselves. . . . Early West Virginia offered to her settlers resources, constantly renewing themselves and yielding an ever abundant supply of meat, clothing, housing and work.

Conservation lessons to be learned:

1. Renewable natural resources constantly renew themselves, and the process is faster and more efficient when resources are wisely used by man.

2. Wise use prevents waste. Pioneer farmers wasted because their problem was one of getting a living quickly out of the land, and resources were abundant.
   Problems and Activities:
   a. How did the natural resources of our state meet the needs of early pioneers?
   b. Students could set aside one section of the classroom or the library for an exhibit on early West Virginia. For it they could collect or make pictures of trees and wildlife common to our state at that time. Different kinds of West Virginia woods could be put on exhibition. The students could present, as a program in connection with the exhibit, vivid word pictures of early West Virginia. Some students could be Indians and de-

scribe our state as the "happy hunting grounds" of their tribe. Others could be pioneer farmers, trappers or lumberjacks. As a conclusion to the project, students could discuss this question: How can we restore to our state some of these extinct or almost extinct trees and wildlife?

c. Describe a day in the life of a lumberjack in an early West Virginia lumber camp.

d. As the lumberjack worked in the forests, how did the trees have room to fall in the thick forests of West Virginia? What happened to the standing young trees—the seedlings—the soil, when logs, chained together, were pulled through the forests or skidded down the mountains? Why is this contrary to conservation practices?

e. What conditions led the pioneer farmers to be wasteful with the forests? How would they feel toward the trees after spending weeks in clearing the land? Some students may have had experience in clearing the land and could give their experiences at this time.

Second Picture or Situation

Let us make another imaginary tour of West Virginia in the years between early 1890 and 1915. The virgin stands of timber are quickly disappearing. Much of the beautiful white pine has been cut away and the hardwoods are fast going. Here and there one can see abandoned sawmills, surrounded by stripped hills. . . . You can see it will not take long to strip West Virginia of all its forests if we continue to use exhaustive logging operations and if we allow fire to destroy our forests.

Conservation lessons to be learned:

1. Natural resources should be used, not exploited.
2. An overabundance of natural resources blinds men to conservation practices, especially when men are interested in developing these resources so as to make a living and create wealth.
   Problems and Activities:

   a. Compare the virgin forests of West Virginia in 1880 with the virgin forests of 1913. Why is there such a difference? Show on map.

   b. Trace carefully with the above picture of fire-ravaged land the stories of at least five species of wildlife in West Virginia that lost their homes during this time and have become extinct or

almost extinct in West Virginia. Have the game protector talk to the class on the wildlife of the county and the needs of a conservation program.

c. Find out and report to the class what has happened to timber lands in your county.

d. Show how the following affected the sawmill operator's use of a forest and led him to "cut out" and "get out."

   (1) Trees grow large enough to make twelve-inch sawlogs in eighty to 100 years in West Virginia.

   (2) Required size for fence posts, mine props or railroad ties can be cut only once in twenty to thirty years.

   (3) Risks of fire to forests.

e. In what ways do the coal industry and railroads of West Virginia depend upon our forests? Why should these companies be interested in conservation?

f. Why has so much land of West Virginia been abandoned by the farmers? How can West Virginia use this soil?

g. What has happened to the chestnut tree in West Virginia?

Third Picture or Situation

Let us see what our state faces today as the result of the past and present practices of our citizens in regard to the use of our renewable natural resources. The virgin forests and much of the wildlife are gone. The coal industry upon which one-third of our population is directly dependent is our largest user of timber. . . . Thus forest production is an important phase of wise land-use, provided there is provision for renewal of trees and prevention of fires.

Conservation lessons to be learned:

1. Wise use means not only to use now for social needs but to provide for renewal of living, growing things.

2. Wise use means not only satisfying immediate needs but long term planning for future needs.

3. Fire is the greatest enemy of conservation. Forest fires are preventable.

Problems and Activities:

a. A timber shortage threatens West Virginia.

(1) In what way does the coal industry depend upon the forests?

(2) Why are mine props now being imported from Virginia and North Carolina into West Virginia? How does this add to the cost of production of coal?

(3) Students like to impersonate adults. Floor talks could be given on:

(*a*) A coal operator's views on a timber famine.

(*b*) A coal miner's views on a timber famine with its indirect effect upon him.

(*Additional activities were listed*)

ACTIVITIES

1. Make a chart as follows: Across the top of a large sheet of paper put the major topics or understandings you expect to develop in the course. Down the left side of the sheet put the seven phases of conservation—use, protection, renewal, substitution, inventory, research, cooperation and planning. Then fill in the table with the type of information that pertains to both the horizontal and vertical column headings. Avoid straining relations to fill all the spaces. Use only the most pertinent subject matter concerning natural resource management.
2. Compare the modern core curriculum with the regular subject organization as to adaptability for teaching conservation.
3. Prepare a unit similar to that of West Virginia for your state.
4. Prepare a unit—The History of the Conservation Movement—for the twelfth grade.

5. Use the form on this page in determining aspects of each school subject that relate to each major understanding in the outline on pages 69 to 74. After each aspect indicate the grade level to which each is adapted.

Major Understandings	*Science*	*Geography*	*Economics*	*Other Subjects*

Chapter VII

APPROACHES AND FIELD WORK

"**WHEN shall I teach conservation?**" Any time of year may be the right time to teach conservation of natural resources. The main point is that the teacher should make the greatest possible use of the things that are happening to the natural resources at the time the teaching is being done. Utilizing local events in the field of natural resources provides a variety of processes to be observed, relationships to be figured out, causes and effects to be connected.

In the North it will be more effective to teach field phases of conservation of natural resources in the fall and spring when field trips can easily be made.

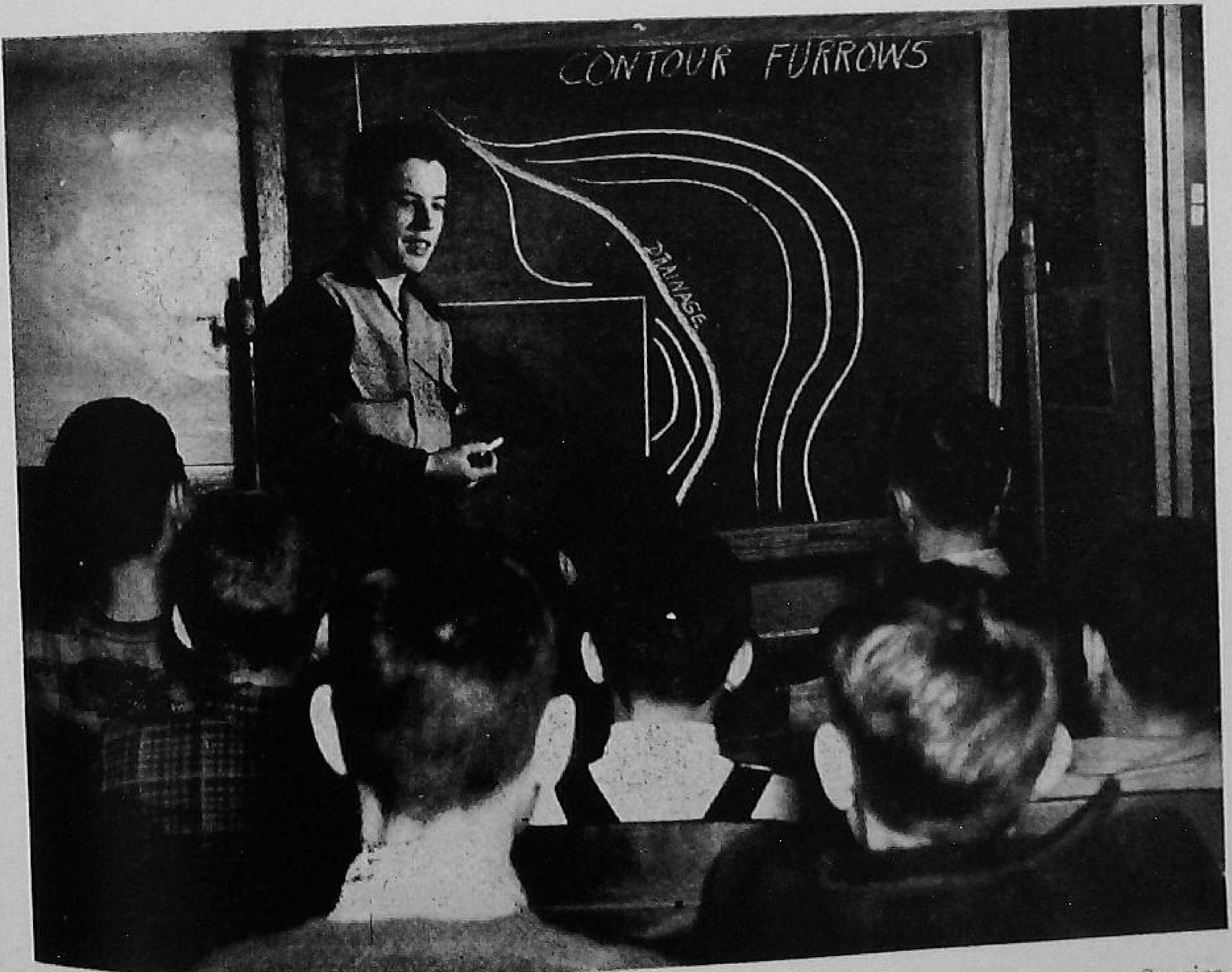
With what shall the teaching begin? A wise teacher will apply the general rule of starting with the near at hand, the familiar, the student's interests and experiences or the locally important.

This problem might be restated, "In what things of the natural environment of this community are students most interested?" The answer may be found in something about wildlife peculiar to the locality, the gathering of nuts in fall, the building of a dam in the neighborhood, the opening of a hunting season, a forest fire or a dust storm. In a farming region one would logically start with a study of soil conservation, in a forest area with forest conservation, near a game preserve with wildlife.

An approach through soils. A unique way to introduce a unit on conservation is to ask students, "What is the basic natural resource?" Explain that there are many things we could not get along without but that in conservation there is one resource that is basic. A number of

substances such as wood, coal, air and water may be mentioned and discussed briefly. The basic natural resource, of course, is soil.

After the resources have been discussed and the decision reached it would be logical to follow with the careful examination of a sample of soil. Teach students to use the term "soil" instead of "dirt." It is dirt when it is out of place on the floor of a house or when it muddies a stream. The soil chosen preferably should be dark in color. The dark color denotes high organic matter content. With a sample before each student the teacher should encourage careful examination of the soil samples for different things that can be seen. These should be listed on the board under a heading "What can we see in soil?" The list may contain such items as pebbles, sand, pieces of leaf, a worm, a stick, lumps and crumbs. Students should look at a sample of soil under a compound microscope for further extending



Soil Conservation Service

A 4-H boy explains how contour furrows prevent washing.

the list. This may be followed by another list "What are the characteristics of soil?" Here would be listed weight, smell, color, air spaces, particles of different sizes and shapes and other characteristics. This examination should greatly clarify the students' conception and understanding of soil. The significance of these facts in managing soil to maintain its productivity ties in with conservation concepts.

Approaches through forestry. A teacher in a community where forests are the dominant part of the environment and soil problems are not acute might well start with an approach through forestry. Tree identification is one that will fit many situations, but this should be carried out in such a way that it has significance in conservation and is not merely an isolated exercise. Tree identification in itself is not conservation. Students, however, should realize that identification is necessary in reading nature's language, that the kinds of trees one finds in an area tell much about the fertility of the soil and water in the soil. The forester must know tree species so he can tell which trees to cut, when and how many, in order that the forest may be kept productive. The kinds of trees will determine to some extent the kind of wildlife to be found in the area and also what industrial use the forest may have.

The coloring and falling of leaves may serve for introducing conservation but it must be remembered that this process in itself has little value so far as understanding conservation is concerned. Many occurrences may be very interesting and informative and so serve to introduce a unit on conservation, but to function as conservation education such events as the coloring and falling of leaves must be made significant as providing protection of soil, checking run-off by storage of water, protection of animal life or, on the other hand, increasing the fire hazard.

The cross-section of a tree trunk and a discussion of the annual rings may be made interesting to students. Determining the tree's age is a good starting activity. There may be speculation as to the cause of certain irregularities. There may be indications of injuries, old

U. S. Forest Service

Cone gathering to obtain seed for school forest nurseries is a good conservation activity for all student groups.

fire scars, variation in rainfall and many others. Narrow rings and wide rings indicate dry and wet years respectively, many successive narrow rings may indicate a series of droughts or a desperate struggle for life in a crowded forest or on poor soil.

FIELD WORK

Get out of doors. Conservation offers the teacher and pupils real life problems. Unless instruction in natural resource management gets out of doors it will lack effectiveness. Conservation deals with material things. So must conservation instruction.

All instruction in conservation should provide field work. The teacher should go over the ground ahead of time and plan what to observe and what to do. It is not necessary that the pupils have long

preliminary instructions previous to observation trips if the teacher is prepared to keep their eyes "popping" as he reveals a new world to them. A discussion of the things learned and their significance should follow each trip. A good teacher will not be content with field trips in which the students only look at something. Every student studying conservation should carry out real conservation projects. City pupils may well be encouraged to spend a summer or two employed on a farm, in a forest or other primary production area.

If the trip involves work experience such as building a dam, terracing, tree planting, developing a wildlife food area, the students and teacher should plan and make preliminary trips to survey the area to be developed. This should be followed by making detailed work plans before actual work is started.

U. S. Forest Service

Stream improvement work is another activity that may well be carried out by conservation students. A good teacher will not be content with field trips in which the students merely look at something.

First-hand experience on a real problem is necessary to give the students an understanding that conservation is practical. Anything short of that is inadequate and may only lead to disillusionment after school days. Term papers, making of booklets, making collections may have their place but the solution of an actual problem on the land is the ultimate test for effective teaching of conservation.

Should the school own or lease land? Neither school ownership nor leasing of land is necessary. Often access to land can be secured in other ways. In many communities there are tracts of land that are considered wasteland, owners of which often are willing to have groups make improvements that will be an asset to the community. There are often tracts of public land on which there is need of erosion control or planting for productive purposes. An eroding road embankment can be used as a problem.

Making a survey of the problem, reaching a decision and planning what should be done, getting approval from authorities to do certain things and solving the many problems of actually doing the work will provide real problems in conservation.

Often the school grounds themselves present problems of erosion or possible better use of certain areas. In prairie regions the planting of a shelterbelt may be the conservation project.

The county or community may have acquired, through tax delinquency, property that can be used by the school. In other cases grants have been made to the school by individuals or by the county. Often abandoned land can be purchased very reasonably by schools. In other cases tracts of land in state or national forests have been turned over to a school for conservation study and practice. Some farmer may welcome assistance of a class in terracing, planting or caring for trees or in planting fish in a stream or pond on his land. The determined teacher can find land some place to work on.

Conservation measures do not require the continuous attention that activities with livestock do, especially at times when the school is not in session. In the case of agricultural crops there are certain periods when immediate action is necessary. This is rarely the case

with land devoted to forestry or wildlife. Operation of agricultural land usually involves more cash outlay than does a long-time program of conservation in non-agricultural production.

Whose responsibility? Before a school undertakes the management of land for teaching conservation there should be an understanding between the landowner, school officials and the teacher as to all aspects of tenure, joint planning and the extent to which classes will carry out conservation measures. That school is fortunate that has some member or members on the faculty who have had special training or experience in forestry, wildlife, soil and water management. In some cases the vocational agriculture teacher is given the responsibility for the over-all planning for school operated lands. In case no one with such training is on the faculty, possibly the county agent, a representative of the Soil Conservation Service, the state or

Sandbagging to hold the soil in this developing gully. Students should be given every opportunity to work on such projects.

extension forester or a local forest ranger would be willing to act at least in an advisory capacity.

ACTIVITIES

1. Find out what conservation problems are most acute in your community.
2. List the places to which a class might profitably be taken to see the need of conservation, where conservation activities are in process, where the results of such activities are evident.
3. Make a survey to find land that might be secured for a school forest.
4. Make a list of people in your community who might serve in an advisory capacity to the school with respect to conservation activities.
5. Find out where students may get summer employment in conservation work.
6. Make a plan for a class field trip in your community.

Chapter VIII

SELECTING STUDENT ACTIVITIES IN CONSERVATION

CAUTION. The present emphasis on student participation is admirably adapted to the teaching of conservation. However, gathering leaves of many trees, pressing, printing labels, mounting, binding and drawing a beautiful cover for a book may so occupy the student's interest that he misses the greater significance of the leaves and the trees. These other learnings may be very much worthwhile, but in teaching conservation they should be secondary, not primary.

It should be kept in mind also that a poor selection of actitvities by the teacher may give results directly opposite from those desired. Solving a problem in algebra is the same any place and time, but an activity that is conservation in one place or time may be the opposite of conservation at another place or time. An activity carried on with certain standards of workmanship may result in conservation, but with lower standards of workmanship may cause devastation.

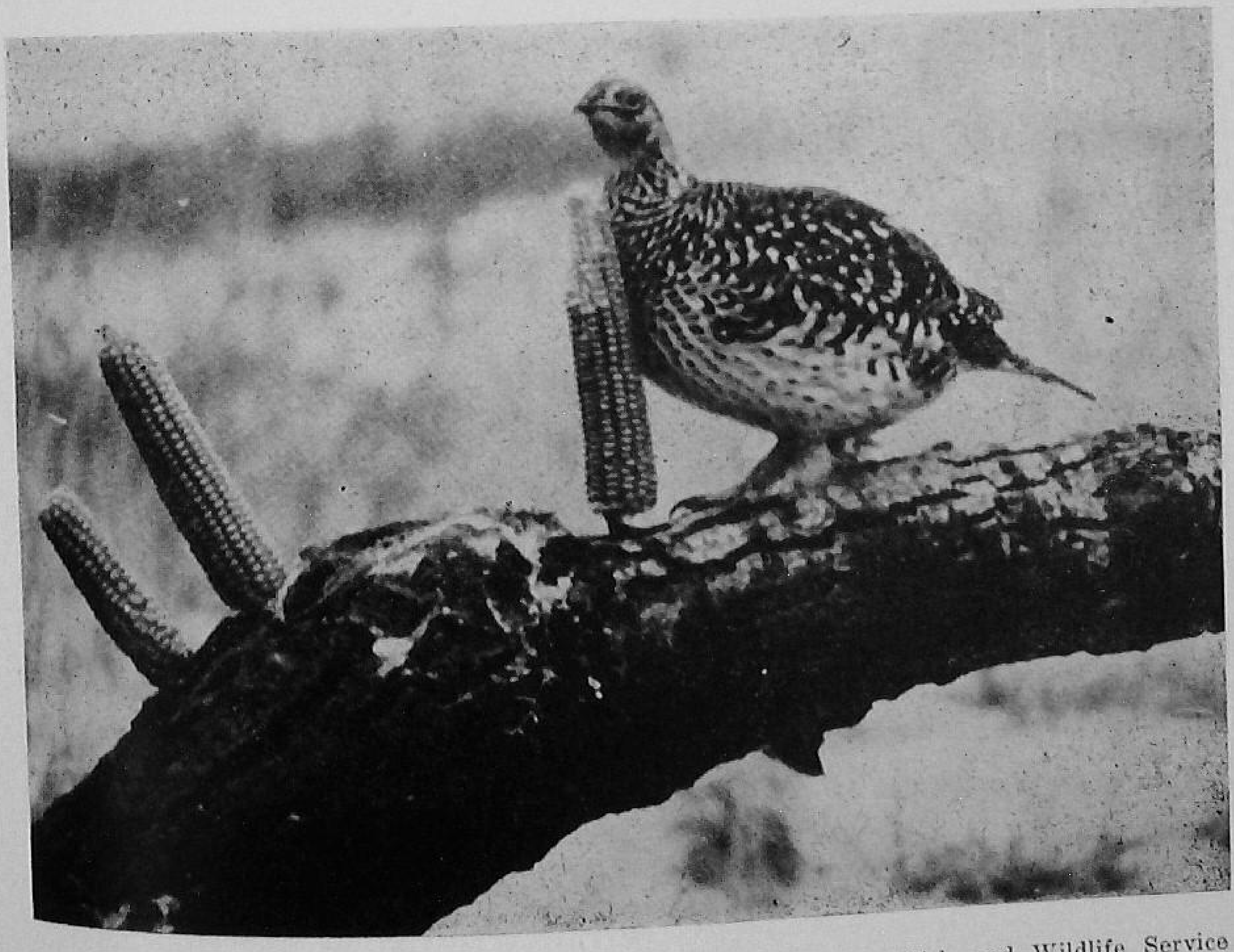
A number of the more common "conservation activities" are discussed here to aid the teacher in selecting and carrying out activities more effectively.

Building bird houses. Nearly everyone can build a bird house of some kind. There usually is a ready interest in it. Possibilities for visible results are good. A bird house may be so built or placed that it becomes a trap for the bird rather than a refuge. It may be so built that an undesirable species may inhabit the house and thrive to the disadvantage of the species of bird for which protection was intended. Conservation cannot be achieved by good intentions alone nor can activities for teaching conservation be selected carelessly.

To develop conservation understandings by means of the bird house building activity, the student should recognize and find answers to these questions: What bird needs protection in the community?

Why? From what? How can this be supplied? Will bird houses help? What kind and size? How and where placed? With the answers to these questions the student will recognize certain relationships as pertinent to the solution of a real problem. That will make his activity meaningful and worthwhile.

Feeding birds. This activity is effective in begetting interest in birds and may be justified on that ground alone. However, if it is to contribute to an understanding of conservation more attention will have to be given to it than merely scattering some feed. The problem here is much the same as building a bird house. An exotic bird, doing more harm than good, may be encouraged. Birds may come to depend on the feeding and cease to forage for insects or weed seeds, or the concentration of birds about the feeding station may attract their enemies, hawks or cats, and in the end the activity selected and



U. S. Fish and Wildlife Service

A grouse on North Dakota Wildlife Refuge finds corn on a tree. Winter feeding of birds helps them over storm and blizzard periods.

carried out with the best of intentions may lead to anything but conservation. Feeding birds is an effective conservation activity when properly done. Emergency feeding after a heavy snow or sleet storm and planting feed crops are sound practices.

Identifying trees. As frequently carried out by classes this very common activity does not develop any conservation concepts. Tree identification may be interesting and for some may become a hobby. It may vitalize an otherwise dull textbook course and in that way be very worthwhile, but identifying trees apart from their relationships is not a conservation activity. It might be compared to learning the alphabet without learning to read.

Tree identification does become a conservation activity if the purpose is related to land use or has a bearing on some resource problem. When the forester is marking trees for cutting he has to identify trees. Such identification is conservation, because he uses it in determining which trees are to be cut and which are to be left. If a piece of land is to be planted with trees in order to check erosion, identification of the seedlings being planted is necessary so that only proper species be planted. In any case a real problem should provide the purpose of identification or there should be an evident relationship between the different species identified as to adaptation to soil or as to use.

Planting trees. Many a tree has been planted without the planter developing any concept of conservation. A purely ornamental planting may have a symbolic significance of resource management but certainly is not a conservation measure to the extent a planting would be on an eroding hillside.

Arbor Day has potentialities for teaching conservation that have never been realized. Too often its observance is ninety-nine percent ceremony and one percent tree planting—one tree planted in a wrong place. One of the early leaders in conservation in this country felt that Arbor Day, as observed, diverted people's attention from the problems of our vast forest resources to one comparatively insignifi-

U. S. Forest Service

This youngster has standard equipment for tree planting.

cant tree. The size and kinds of trees and the methods used in an Arbor Day planting are so different from the conditions under which conservation planting is done that the two activities have little in common. Planting a single tree on the school grounds, if done consciously as a symbol of what needs to be done on great areas of our land and that fact is pointed out, will develop conservation concepts. The planting should lead to a discussion of the reasons some states and the federal government have planted millions of trees. The planting of trees by a class will be of most value if the planting meets some definite need, such as checking soil erosion. Even though each student plants but one tree, the problem being solved should be uppermost in the student's mind.

Gardening. As usually handled this activity has little value for teaching conservation. Unless the teacher points out significant con-

servation concepts, such as suitability of soil for gardening, making a compost heap or preventing erosion, it may be just raising vegetables.

A tract of unsightly land near a certain school was made the basis of the problem, "What use should be made of this land?" It was decided that this ground was suitable for a garden. It was changed from idle to productive land. These students had an excellent lesson in conservation.

Whether or not there were further lessons in conservation depended largely on the problems encountered and what was done about them. If a conscious attempt was made to improve the soil, certainly the discussions and consequent activities gave basic knowledge of conservation.

Control of insects may have contributed or not, depending on the degree to which insects and the host plants were understood as an example of natural balance.

Care of the crop may have been made most instructive by pointing out that, to get quality and quantity, some plants or blossoms may have had to be sacrificed so that other plants or fruits might be better. In harvesting it should have been pointed out that provision for another crop requires the saving of seeds from the best plants and the return of waste parts of plants to the soil.

To the extent that such understandings are developed, gardening serves as conservation education.

Studying wildflowers. To merely decry the abuse and passing of certain species of wildflowers, to identify them, to refrain from picking them, do not in themselves constitute effective or sound conservation activities. Certainly the beauty of wildflowers as a part of the landscape should be emphasized, but they have other uses. They cover and protect soil; they help build up the organic matter in soil; they provide food for bees, birds and animals.

Wildflowers are not an unmixed blessing. Some are noxious weeds in the farmers' fields. A few wild plants are poisonous.

Certainly a student should be presented with the whole picture and given a sound basis for judgment; not merely a blind sentimental notion that all wildflowers, no matter what they are or where they are, are desirable and not to be molested. Certainly there are pieces of land, the highest use for which is the growth of native plants.

The fact that wildflowers fit into the natural balance is one of the major reasons for their consideration in conservation of natural resources. A study of wildflowers without recognition of such relationship is not effective teaching of conservation.

Killing predators. Few would question that killing of certain predators under some circumstances would be a conservation activity. Killing predators may or may not be conservation. It must be remembered that maintenance of the natural balance is the first principle of conservation. Predators have a place in that balance. Whether or not killing predators is a conservation measure depends on whether the balance is already disturbed by the existence of too many predators. Natural balance would eventually be restored by starvation of the predators but man may restore the balance more quickly by shooting some of the predators. In that case he would be performing a conservation activity.

If, however, there were too few predators to keep certain other species from overpopulating and destroying vegetation, it would be a mistake to kill the predators. Conservation in that case would be the killing of some of the overpopulating species.

Killing of predators attacking domestic fowls or young livestock is certainly justifiable but it is doubtful whether a campaign to kill all the predators in a large area would be a sound conservation measure. A rancher who kills all the coyotes may find his grazing lands ruined by prairie dogs or jack rabbits. Sometimes it is necessary to remove both predators and prey to keep a natural balance.

Making a rock garden. Many an intended conservation activity has ended on the rocks because the purpose was wrong. Landscaping is one thing, conservation is another even though they may overlap on

occasions. Landscaping is primarily to improve appearance. It may be used to solve an erosion problem too. Planting spirea at the corner of the house or making a rock garden or lily pool in the back yard for aesthetic reasons is purely landscaping. If soil erosion is checked by making a rock garden that activity is conservation as well as landscaping.

It is possible to start a group of students in a landscaping activity and out of it develop an interest in and understanding of conservation but if the latter is the end sought the activity must have more significance than ornamentation.

Writing a theme on conservation. This activity is certainly a tried and true friend of the teacher. It lacks the earmarks of a modern activity program but it does have the value of affording the student a means of expressing his ideas about the management of our natural resources. Theme writing lacks the realism of tree planting, but it has the advantage of permitting the student to give evidence of whether or not he understands the major points of conservation.

A common difficulty has been that many themes on conservation have been too sentimental or have presented an extreme protectionist attitude. Themes should show an understanding of natural balance, natural selection, food chains, the idea that natural resources have value only as used by man, cause and effect in nature and solution of problems in resource management.

Making a chart of food chains. A student will get a better understanding of conservation from making charts of food chains than from identifying all the trees in his county, as identification is ordinarily carried out. Food chains are a form of *interdependence, one of the fundamentals of conservation.* If the student works out the basis for such a chart, he is almost sure to acquire some of the basic concepts of conservation.

If in addition the charts are made to include *interpretation* besides simple food chains, there can be little doubt as to their value.

U. S. Fish and Wildlife Service

Bush shelter protects young fish and promotes growth of food organisms.

The shortcoming of such an activity is in the fact that a student may be able to make such charts and understand the theory but be entirely unable to make any application of the principles in the actual management of such relationships.

Sample conservation activities for common units. Typical activities that may be used to develop understandings in conservation in the teaching of certain commonly used units are given here.

Shelter

1. Collect pictures showing how the natural resources in an area determine the kind of houses people build. Which use mostly renewable resources, which use nonrenewable.

Food

1. Secure data to show extent to which wildlife is a source of food in the United States.

2. Compare efficiency of domesticated and wild animals as machines for producing food from various kinds of land.

3. Find out what practices are used to keep soils fertile or productive.

4. Find out why more people can live on the grain and vegetables grown on a certain area of land than can live on the meat or other animal products produced on the same amount of land.

5. Find out what crops in your area are soil building crops and which are soil depleting crops.

6. Find out what "aquaculture" is. Compare amount of food that may be produced by a five-acre pond and that on five acres of land.

7. Draw a chart to show how use of fish for fertilizer completes a cycle in restoring soil fertility. Do same for use of tankage for fertilizer.

8. Find out how many head of cattle an acre of native pasture in your community will support. What happens if the number of cattle is increased? Find pictures of overgrazing by cattle; by wildlife.

9. Find pictures showing what happens to man when he destroys productivity of the soil.

10. Find out what states have done to regulate amounts of oysters to be removed from beds each season.

11. Tell about international agreements regarding extent of fishing and hunting.

Clothing

1. Find out what the history of cotton raising has been with respect to soil fertility. What has been the effect on food and clothing of those who raised the cotton?

2. Show on a map where our native grown wool and cotton are produced.

3. Compare the production of the two fibers as to effects on the soil.

4. Find out how soil fertility affects quality of cotton and wool fibers.

5. Compare leather production to cotton and wool as to effect on soil.

6. Discuss the advantages and disadvantages of substituting fabrics made from wood, petroleum, milk and other substances for those made from cotton and wool.

Fuel

1. Write a short story telling how man probably first found out that wood ashes are a good fertilizer.

2. Describe the kind of forest from which coal was formed.

3. Find out the amount of wood used in this country every year for fuel. Why is it so extensively used? What effect does use of wood for fuel have on forest or woodlands?

4. Sketch a scene in Plymouth Colony in 1626, with only man power to bring in fuel logs. Why did they put restrictions on the cutting of forests when so abundant?

5. Read about the early history of glass making, metallurgy, lime burning and meat curing and their relation to forests.

6. Gather some of the material from a forest floor, weigh, dry and reweigh it to determine how much moisture it held.
7. Find out what kinds of live trees will burn by holding small branches of different kinds of trees over a bonfire.

Communication

1. List the different kinds of communication systems and the natural resource raw materials that are used in each.
2. List the advantages and disadvantages from the standpoint of conservation of the increased use of pulpwood for newsprint.
3. Find out about the importance of international trade in pulpwood. Should we buy more or less pulpwood from Canada and Finland?
4. Make a chart to show the comparative value of telegraph and telephone poles, of railroad ties, of wood pulp and other materials used in making newsprint paper and of metals used in telephone and telegraph wire.

Water

1. Collect and discuss pictures of severe erosion.
2. Tell of specific instances or cases of erosion.
3. Find out where your city water supply or irrigation water comes from and whether the watershed is forested.
4. Make a chart of the hydrologic cycle.
5. Compare a map of the United States showing forested areas with one showing distribution of rainfall.
6. Make charts showing the comparative amounts of run-off from forested, grass, intertilled crop and fallow land.
7. Make a rough cross-section sketch of a forest and its soil indicating with arrows where water is held or checked in movement. Do same for grassland.

8. Find in the community indications of the following: (*a*) sheet erosion, (*b*) cutting of gullies, (*c*) breaking down of stream banks, (*d*) deposits of poor hillside soil or debris on otherwise valuable land, (*e*) muddy streams and (*f*) finger erosion.

9. Find pictures of each type of erosion.

10. Set up a demonstration to compare rate of penetration of water into moist and into dry soil, also the amount of absorption of water by soils high and soils low in organic matter.

11. Examine and report on forest floor cover as to depth, what it consists of, stages of decomposition, moisture in the cover and in the soil, depth to which organic matter has darkened the soil.

12. Find and collect pictures of erosion following deforestation, overgrazing and other causes of erosion.

13. Report on a project by which soil erosion has been checked.

14. Make a chart showing the amount of sediment carried in some of the more important rivers of the United States and explain the reasons for the difference.

15. Compare the amount of sediment, noting the proportionate amounts of fine and coarse material in two samples of water from a stream, one taken when normal and the other taken at flood stage.

16. Make a list of the government agencies concerned with soil conservation.

17. Define the following terms: duff, run-off, absorption, humus, precipitation, percolation, evaporation, infiltration, ground water, gravitational water, capillary water, water table, gully, porosity, alluvium.

18. Build dams and terraces; improve streams; restock a stream or lake with fish.

Lumbering

1. Find out what kinds of wood the early colonists used for building homes, boats and ships, wagons and carts, and tools.

2. Find pictures of good and bad forest cutting and list the differences shown.

3. Find out what is meant by seed trees, wolf trees and weed trees.

4. Find out how the slash (branches and tree tops left in lumbering) may be disposed of so as to reduce dangers of forest fire after logging operations.

5. Give several reasons why old trees, not young ones, should be cut.

6. Report on ways in which waste in lumbering has been decreased. How does the use of what might otherwise be waste enable the operators to reforest, protect from fire and use other conservation measures?

7. Report on what often becomes of land and workers after a forest has been cut.

8. Find out the differences in logging for timber and for pulpwood. What about each makes conservation difficult?

Recreation

1. Make a trip to a recreation area and list the natural resource features that make the site of value for recreation.

2. Tell why conservation is essential in recreation areas.

3. Make detailed plans for a recreation area for your school or community. Which features involve conservation practices?

4. Discuss reasons areas where natural resources have not been properly handled are not suitable for recreation.

5. List differences between a park and a forest.

Indians

1. List things the Indians did to keep up their food supply that we would consider as conservation. List also their wasteful practices. Why were such wasteful practices unimportant?
2. Discuss American Indian population before the arrival of the white man with relation to land areas in comparison to present total population in the United States.
3. Discuss whether Indians controlled their environment or whether they were a part of the natural balance as were the deer.
4. Find out how the coming of the white man upset the Indian's place in the balance of nature.
5. Find out what the Indians thought of plowing the prairies.

The Pilgrims

1. Find out when the first sawmill was brought to America, where it was located and how the early sawmills affected the colonial economy.
2. See 4 under ***Fuel.***
3. See 1 under ***Lumbering.***
4. Discuss whether the colonists and early settlers were justified in their methods of clearing land.

The Circus or the Zoo

1. Find out which animals come from the forest, from prairies, from fresh water, from salt water and from other areas and what part they played in the natural balance of their respective habitat.

2. Find out how each animal is especially fitted to live in its native habitat.

3. Find out how wild animals in the circus and the zoo help us understand animals in the wilds.

Stories of Heroes

1. Read and tell of incidents in lives of the Vikings, George Washington, Daniel Boone, Abraham Lincoln, Lewis and Clark and others in which forest lands, waters and wildlife were of major importance.

2. Read and tell about early conservationists, Franklin B. Hough, Gifford Pinchot, Theodore Roosevelt.

Living in Other Lands

1. Find out whether other countries have much or little forest land, whether they have forest products to sell or whether they must buy.

2. Draw maps to show where the forests, grass lands and cultivated lands of the world are found.

3. Compare Scandinavian countries with Greece and Italy as to whether they have taken care of their forests and other resources, and how the lack of natural resources has affected the people.

4. Compare pictures of typical homes of people on the plains or in desert lands with those in forest lands, as to the extent of use of wood.

5. Classify principal countries into three groups: (*a*) those which have not practiced conservation and have reaped dire results;

(*b*) those which have not practiced conservation and still have ample resources; (*c*) those which by use of conservation have maintained a good standard of living.

Our Industries

1. Make a table showing how certain industries such as pottery, leather, publishing, mining, metallurgy, glass making, motion pictures, farming, rubber, oil, textiles, plastics and power are dependent upon conservation of natural resources.

SUGGESTIONS FOR EVALUATING AND SELECTING ACTIVITIES

The following questions are suggested as major criteria to assist the teacher in evaluating and selecting activities for teaching conservation:

1. Does the activity attempt to solve a real problem in soil fertility or erosion, in forest fire control, reforestation, stream improvement or similar problems or merely result in pencil and paper work?

2. Does the activity require an understanding of or make evident the interdependence of the different natural resources?

3. Does the activity include careful planning with consideration of possible good and bad effects?

These questions are not "iron clad" tests but if applied should be of assistance to the teacher in not only selecting activities but in carrying out the activities more effectively. The list given on page 115 under the heading "Evaluation of Instructional Materials" should be referred to for an expansion of these criteria.

The following form is suggested for evaluating and selecting activities for teaching conservation:

1 *Activities*	2 *Grades*	3 *Rating*	4 *Remarks*
(Example) Identifying trees	All	C	Needs to be stated more specifically for different levels. Merely to identify gives no understanding of conservation.

In column 2, indicate by numbers 1 to 12 or by "lower elementary," "senior high," etc., the grades to which the activities are thought to be best adapted. If suitable for all grades, indicate by "all." If not adapted to school use, indicate by "none."

In column 3, rate the activity as now stated, using this legend: A—excellent; B—good; C—average; D—poor; E—very poor, insignificant or not to be used.

In column 4, use the space to give reasons for your grade level placing or rating, or indicate any modification of the activity you believe would make it qualify for the grade level on which you placed it or the rating given it.

Sample activities for evaluation. The list of activities given below is for use in the form shown above. An attempt has been made to group somewhat similar activities but of different values. This grouping also makes apparent ways in which a poor activity may be converted into an effective activity. Some of the activities in this list are controversial. Certain people would not agree that learning to be a good marksman, conducting a crow killing campaign, are conservation activities. They would be right in some cases, but when they would be and when they would not be is difficult to decide.

1. Clipping newspaper items on forest fires.
2. Writing forest fire slogans.
3. Making a fire line in a forest.
4. Studying forest areas, one burned, one not burned.

5. Learning to build and put out a camp fire.
6. Planting shrubbery around the house.
7. Planting a tree on the lawn.
8. Raising a garden.
9. Planting a tree on Arbor Day.
10. Planting a windbreak about the farmstead.
11. Planting wildlife food plants on wastelands.
12. Planting trees in a school forest.
13. Organizing a group for distributing seedling trees in the community.
14. Promoting establishment of a school forest.
15. Counting the rings on a tree stump to determine age of tree.
16. Collecting tree leaves.
17. Identifying wood.
18. Making a collection of wild flowers.
19. Developing a natural resource museum for the school.
20. Developing a natural resource library.
21. Making a survey of forest tree insect damages.
22. Carrying out control measures for white pine blister rust.
23. Conducting a campaign for community attack on tent caterpillars.
24. Studying the life of Corot, a famous landscape painter.
25. Working a problem on how long our coal supply will last.
26. Writing a theme on conservation.
27. Making a booklet on some phase of forests.
28. Making a poster on forests.
29. Writing an article on forests for the local paper.
30. Preparing a forestry exhibit for a show window.
31. Seeing a motion picture on forestry.
32. Giving an assembly program on conservation.

33. Making a map of the school grounds showing all trees and shrubs with their names.
34. Mapping the land uses in the community.
35. Making a map of the Mississippi basin.
36. Making a map of forest recreational areas for the state.
37. Taking an outing in a forest recreational area.
38. Planting hollyhocks along the roadside.
39. Developing a nature trail in a forest.
40. Putting up signs "Do not pick wildflowers."
41. Visiting a sawmill.
42. Visiting a forest nursery.
43. Visiting a forest lookout.
44. Inspecting a soil erosion control dam.
45. Building a small dam in a gully.
46. Improving a stream to deepen and increase rate of flow at certain points.
47. Finding out about the life cycle of a frog.
48. Studying vanishing or extinct species of trees, birds and animals.
49. Finding out what a quail eats.
50. Killing a hawk near the poultry yard.
51. Learning to be a good marksman.
52. Learning about snakes.
53. Putting a bell on a house cat.
54. Hatching and rearing some pheasants or quail.
55. Building brush shelters for quail.
56. Feeding birds in winter.
57. Making diagrams of food chains.
58. Killing a wolf.
59. Conducting a campaign to kill crows.
60. Observing the law in fishing.

61. Studying hunting laws.
62. Posting your farm against hunting.
63. Killing rabbits in an orchard.
64. Killing a hawk in nesting season.

Below are five related activities arranged in a suggested ascending order according to their value for teaching conservation:

1. Collecting pictures of trees.
2. Identifying trees in the school yard.
3. Identifying trees on different sites (slopes, soil types, etc.).
4. Identifying trees used for erosion control in different conditions.
5. Identifying and marking trees in a school forest for making a selective cutting.

The following group of activities deals with development of attitudes. Are they given in ascending order? If not, try arranging in that order.

1. Studying hunting and fishing laws.
2. Obeying those laws.
3. Seeing that associates obey them.
4. Not taking the legal bag limit of game when you feel conditions do not justify it.

Pick from the list on pages 104-107 groups of related activities and arrange in ascending order of value as conservation activities.

Chapter IX

MEASURING EFFECTIVENESS OF TEACHING CONSERVATION

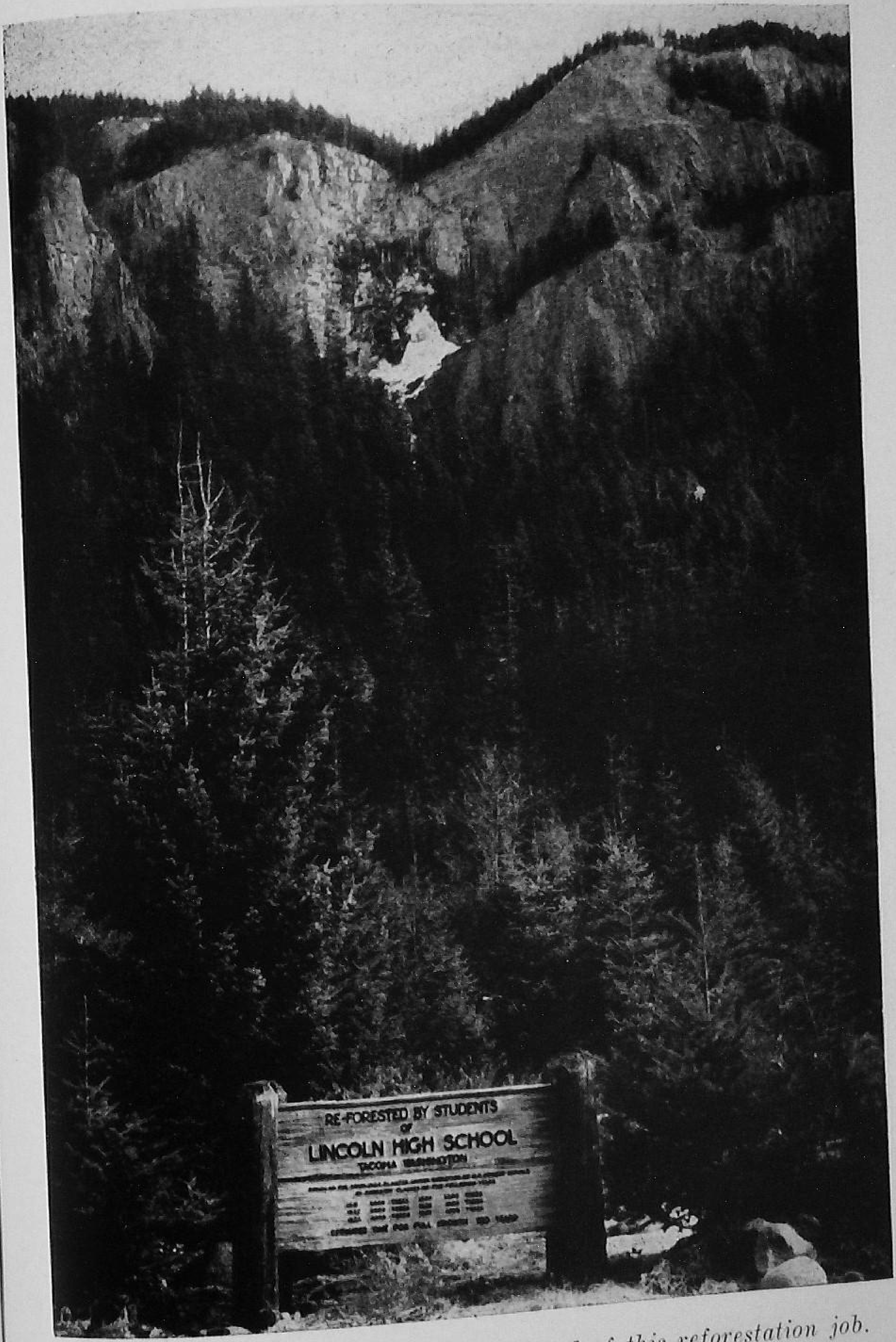
EFFECTIVE instruction. Instruction is effective when it meets the objectives for which is was given. Objectives in teaching conservation vary with the group being taught.

Information tests. Since information about natural resources is a means of reaching objectives in the development of attitudes and abilities, one method of measuring effectiveness of instruction is to use the common testing procedures to determine whether students have acquired the basic facts and know their relationships. Such testing is merely a beginning.

Methods of testing attitudes. There are many attitudes regarding conservation. On one extreme is the protectionist, on the other is the liquidationist. The proper conservation attitudes lie somewhere between these.

Certain techniques are given here for use in determining or measuring attitudes regarding conservation of natural resources.

The five-statement choice. In this method the person indicates which of five statements, of varying degrees to each side of a median opinion (which is considered to be the correct one), most nearly agrees with his opinion of the way in which a natural resource should be handled. For example, the person being tested is asked to indicate which statement in each of the following sets of five he considers as most accurately describing his view on the problems in several fields of conservation.



Tacoma, Washington, students are proud of this reforestation job.

Attitudes toward forest use.

1. We should use less wood and wood products and thus save our forests.
2. Forest conservation would be largely achieved if the great waste of wood in logging and at sawmills were eliminated.
3. Forests, both public and private, should be so cut that the land will continue to produce forests.
4. Timber should be cut only on privately-owned land, not on publicly-owned forest land.
5. All forests should be in public ownership and used exclusively as recreation areas.

Attitudes about picking of wildflowers.

1. Wildflowers are weeds and should be eradicated.
2. Wildflowers have only aesthetic and no economic value.
3. Some wildflowers may be picked without limit, others within a limit, some not at all.
4. Wildflowers should be domesticated and tended like farm crops.
5. No wildflowers should be picked.

Attitudes concerning wildlife management.

1. Wildlife should be hunted only with the camera.
2. All bounty laws should be repealed.
3. The kinds of species and their number in an area should be controlled by management of the habitat and controlled hunting.
4. Wildlife must eventually be replaced by domesticated species.
5. Government agencies should raise and feed wildlife.

Attitudes about the deer problem.

1. No deer should be shot.

2. Only buck deer should be shot.
3. Both buck and doe deer should be shot in well stocked areas.
4. All deer should be eliminated from farming areas.
5. All deer should be confined to game preserves or refuges.

Comprehensive tests of this kind should be developed by the teacher to find out how nearly the students have attained correct attitudes. The objectives (left column, page 112) in teaching conservation are usually stated in terms of developing certain attitudes, beliefs or understandings. These in turn are based on certain accepted generalizations (right column, page 112). Whether or not the objectives have been attained may be determined in part by finding out what the students believe with respect to the basic generalizations.

To test for attainment of an objective include the corresponding generalization as one in a set of five statements. For example, a group of five statements including each of the basic generalizations may be made as follows:

Objective No. 1—to sensitize the individual to evidences of resource waste.

(1) There is very little waste of natural resources.

(2) Waste is unavoidable.

(3) Waste is rampant and can be reduced (basic generalization No. 1).

(4) Waste may be recovered when needed.

(5) Waste is beneficial to dispose of surpluses.

Each of the following generalizations should be used as the proper statement in sets of five statements as in the foregoing example.

Objectives*	Basic generalizations through which objectives may be attained
1. To sensitize the individual to evidences of resource waste.	1. Waste is rampant but can be reduced.
2. To develop an understanding of natural resources.	2. The natural resources are the source from which man's needs are supplied.
3. To develop an idea of the scope of conservation of natural resources.	3. There are many facts about natural resources that are so remotely related to conservation that such facts are insignificant in a study of conservation.
4. To create geographical habits of thinking.	4. Man-made structures and institutions all originate in natural resources.
5. To correct the belief that resources are inexhaustible.	5. Our resources were inexhaustible for a few million people but are not for 150,000,000.
6. To promote the idea of trusteeship as a responsibility of ownership.	6. Natural resources belong to mankind or society rather than the individual. Public ownership of certain lands is better than private ownership.
7. To dispel the notion that science can supply substitutes for natural resources and so achieve the equivalent of conservation.	7. Matter cannot be created; substitutes are made of natural resources.
8. To explode the idea that foreign trade can compensate for exhausted resources.	8. Trade is basically an exchange of natural resources.
9. To build a new social philosophy of rights.	9. The individual has a responsibility to society.
10. To cultivate a new community ambition.	10. Social improvements are more important than population increase.
11. To realize that maintenance of natural balance is paramount.	11. Man must work in harmony with natural laws.
12. To reduce sentimentalism and replace with economic and social judgments.	12. Man must work in harmony with economic and social laws.

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*Objectives 1-11 excepting No. 3 from article "Education and the Conservation of Resources" by G. T. Renner, Professor of Geography, Columbia University, in *The Social Frontier* of April, 1939. Objectives 3, 12 and 13 from article "Objectives in Conservation Education" by the author in February, 1938, Bulletin of the Department of Secondary School Principals.

Degree of agreement. Another evaluation device is the statement to which a person may agree or disagree to varying extent. For example, he may (1) disagree absolutely, (2) with limitations, (3) be indifferent to, (4) agree with limitations, or (5) agree unqualifiedly to these statements:

1. The federal government should exercise control of all streams.
2. Highways should not be straightened where cutting of trees is necessary.
3. Lumbermen should be required to leave strips of timber along highways.

Individual performance. The Student's Outdoor Creed may serve as a standard for evaluation of training in conservation.

THE STUDENT'S OUTDOOR CREED

I believe that my outdoor manners reflect what I am at home.

I believe that public property is for all of us and that I should play fair in its use.

I believe in securing permission before using or entering another's property and will leave it without damage.

I believe in absolute safety with firearms and will observe all precautions in their use.

I believe in taking only legal fish and game and will do my part in their propagation.

I believe in keeping waters, highways and camp grounds clean.

I believe that carelessness with fire is a crime against humanity and will do all in my power to keep America beautiful and productive, and will do something constructive with our natural resources each day I spend in the out-of-doors.

Social performance. The final measure of the effectiveness of conservation teaching with respect to recreation, for example, will be (1) the enactment or repeal of laws to encourage proper use of natural resources, (2) a decrease in game law violations, (3) a decrease in man-caused forest fires, (4) a decrease of vandalism in public recreation areas, (5) a decrease in specialization of conservation interests by laymen, that is, fewer persons interested in maintaining only one species of animal for selfish reasons.

The training of those who will become farmers may be evaluated by specific indicators such as (1) the acreage of legumes they raise, (2) the maintenance of crop yield per acre with livestock manures and other fertilizers, (3) the methods of tillage used to prevent erosion, (4) the extent of their cooperation in conservation programs, and (5) their adaptation of crops to type of soil and topography.

The training of those who become lumbermen, miners, fishermen, likewise may be evaluated respectively by indicators, such as (1) the size of trees they cut, (2) the extent of stream pollution they cause, and (3) the size of fish they keep. For each of these occupations there are many other specific measures of the extent to which conservation is practiced and, therefore, of their understandings, attitudes and abilities in resource management.

Evaluation as training. The teacher's interest in any testing program is to improve instruction. The traditional examination to determine a grade for the report card is inconsequential in comparison to effective instruction in training citizens to perform in accordance with the principles of conservation.

The student should be acquainted with the standards used in evaluation and be expected to apply them to his own conduct and that of his colleagues. In other words, standards of action should be the aim of teaching conservation.

The student also should be able to recognize degrees of achievement, that in one situation practice "X" may be the most justifiable at the time but that practice "Y," a degree better, should be expected

in the future and that eventually practice "Z," the best that is known, is to be attained.

Evaluation must start with and accompany instruction. Student attitudes should be determined at the start of a conservation unit as well as at the end. Progress must continuously be measured with respect to objectives.

Evaluation of instructional materials. In order that the most effective teaching of conservation be possible, it is necessary that textbooks, reference books, bulletins and unit outlines present sound views on the most important aspects of conservation problems. To guide in appraising instructional materials the set of questions given below will be found useful. The greater the number of these questions that can be answered in the affirmative about instructional material on conservation, the better is the material.

Many times it will be impossible to give a positive yes or no answer and in other cases the material may be too brief to be expected to satisfy all the points of the "yardstick" yet it will serve as a standard just as a one-foot rule may be used in measuring less than twelve inches.

Suggestions for evaluating instructional materials dealing with the conservation of natural resources:

Major concepts or technical aspects

1. Is conservation presented as *wise use* extending over a period of years rather than as hoarding?
    - *a.* Is it so defined?
    - *b.* Does the context bear out the definition?
    - *c.* Is the diverse nature of the different resources recognized?
2. Are the major natural resources named and classified as renewable and nonrenewable?
    - *a.* Are the differences fundamental to their proper management pointed out?

b. Are distinctions recognized as between the natural resources and such things as climate and population?

c. Is the exhaustibility of natural resources pointed out?

3. Are protection, inventory, substitution, use and renewal indicated as major activities in conservation? Are these specific terms used wherever possible instead of the more general term conservation?

4. Are research, planning and cooperation recognized as contributory activities to these?

5. Are the economic aspects of conservation recognized?

   a. Is the necessity of building up the capital of the resource considered?

   b. Is the use of the increment rather than the capital proposed?

   c. Is loss recognized as occurring unless resources are used?

   d. Is controlled present use proposed as a means of obtaining greater productivity over a longer period?

   e. Is conservation recognized primarily as having to do with production rather than consumption?

6. Is conservation of natural resources advocated for social reasons rather than merely to save the resources themselves?

   a. Are resources recognized as valueless without man's need and use?

   b. Are people recognized as the major consideration and the resources as a means to an end?

   c. Is conservation urged primarily to alleviate ills resulting from wasteful exploitation that are already upon us and secondarily to avoid future calamity?

   d. Is conservation of natural and human resources recognized as separate fields of activity yet interdependent?

7. Is conservation presented primarily as land use?
   a. Is soil recognized as the basic resource?
   b. Are problems involving competing uses of land discussed?
   c. Are problems of best use for certain land areas involved?

8. Is conservation shown to be dependent upon the maintenance of natural balance?
   a. Are food chains discussed?
   b. Is the hydrologic cycle discussed?
   c. Is the interdependence of the different natural resources emphasized?

9. Is the presentation primarily an appeal to reason and judgment rather than to sentiment only?
   a. Are basic scientific facts recognized?
   b. Are economic difficulties recognized?
   c. Are poems and songs introduced sparingly?

10. Is the achievement of conservation shown to involve the question of the right of the individual to use his property as he pleases as against his responsibility to society, represented by his neighbors, the state, the nation and future generations?
   a. Is it made clear that ownership of land and resources affect the welfare of society and to that extent society has an interest in conservation?
   b. Is public assistance to the private owner recognized as necessary in certain cases?
   c. Is the question of public ownership of certain natural resources presented as a possible solution?

Educational aspects

1. Are distinctions from the usual nature study or elementary science apparent?
   a. Are the suggested activities real conservation activities or the standard science exercises?

b. Are suggestions as to approximate grade level given?

c. Are appropriate phases for different subjects suggested?

d. Have the most important materials been included and non-related materials excluded?

2. Are local, state and national problems dealing with the natural resources approached in that order?

3. Does the bibliography indicate selection: quality rather than quantity?

4. Do the pictures, maps or other illustrations contribute to a better understanding of conservation?

5. Is the purpose to develop attitudes and abilities rather than to merely impart knowledge? Are activities significant and definite?

6. Have the materials the same general form and organization as other curriculum material used in the school system?

7. Have the materials been prepared cooperatively by educators and conservationists?

8. Have the materials been developed through use in the classroom?

9. Are the materials up to date?

ACTIVITIES

1. Determine which of the major conservation concepts the following quotations violate:

   "If we keep on cutting our biggest trees we will soon have no forests."

   "If we don't find a substitute for hardwoods we can not hope to preserve our hardwood forests."

"The main reason for forest conservation is to avoid a timber famine about seventy-five years from now."

2. Evaluate friends' attitudes on forests and wildlife conservation, using tests on pages 110, 111.
3. Develop five statements for determining attitudes on conservation of oil.
4. What would likely be the shortcomings of a conservation textbook written by a soil technician? By a biology teacher? By a curriculum expert?
5. Adapt the major concepts for evaluation so as to apply specifically to forests, to soils or to wildlife.
6. Make a score card of the above "yardstick" by assigning different values to each point.

APPENDIX

Sources of Information

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American Education Press, Inc. *Unit Study Books on Conservation*. Columbus, Ohio. Written at the fifth grade level.

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American Wildlife Institute. *Wild Ducks*. Washington, D. C., 1941, 25c.

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Baer, Marian F. *Pandora's Box: The Story of Conservation*. Farrar and Rinehart, Inc., New York, N. Y., 1939, 292 pp. $2. Upper elementary.

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Brinser, Ayres, and Shepard, Ward. *Our Use of the Land*. Harper & Bros., New York, N. Y. 1939. $1.50. For teachers and high school students.

Building America. Vol. 2, No. 2, April 1937, p. 1-32 illus., charts. Entire issue devoted to conservation. Shows the waste of our natural resources. Contains pictures, small maps and diagrams, simple statistics and suggestions for teaching. For the junior high school level.

Bunce, Arthur Cyril. *The Economics of Soil Conservation*. Iowa State College Press, Ames, Iowa, 1942. $3. Reference for teachers.

Bureau of Fisheries. *Functions and Activities of the Bureau of Fisheries*. United States Government Printing Office, Washington, D. C. 1934, p. 25-29 illus. Discusses the work of the bureau as one of the government conservation agencies.

Bureau of Mines. *Conservation of Petroleum and Natural Gas*. U. S. Government Printing Office, Washington, D. C. 1936, 35 pp. Discusses what is being done in the field of oil and gas conservation. Primarily for the teacher.

Burges, Austin E. *Soil Erosion Control.* Turner E. Smith & Company, Atlanta, Ga., 1936, 202 pp., illus., diagrams, tables. Based on things familiar to children in explaining terraces, dams, contour furrows and other erosion control measures. Each chapter contains suggested field activities. For teachers and students, grades six to eight.

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Cook, Lawrence F. *The Giant Sequoias of California.* National Park Service, Washington, D. C., 1942. 10c. For senior high school.

Coyle, David C. *Waste: The Fight to Save America.* Bobbs-Merrill Co., New York, N. Y., 1936. 96 pp. For senior high school students.

Dahlberg, E. H. *Conservation of Renewable Resources.* C. C. Nelson Publishing Company, Appleton, Wisc., 1939. 208 pp. $1. Prepared as a textbook for high schools offering a special course in conservation. Arranged in such a way as to be especially adapted for use as a supplementary text in a biology course.

Deusing and Strong. *Soil, Water and Man.* Row, Peterson and Co., Chicago, Illinois, 1943. 47 pp. 32c. For junior high schools.

Elliott, Charles N. *Conservation of American Resources.* Turner E. Smith & Co., Atlanta, Ga., 1940. 672 pp. $1.80. Written as a textbook for junior and senior high schools.

Elliott, Charles N., and Mobley, M. D. *Southern Forestry.* Turner E. Smith & Co., Atlanta, Ga., 1938. 494 pp. illus. Textbook for junior high schools. Is result of several years of classroom experience in forestry instruction. Presents needs and methods of southern forestry primarily, but suitable for general needs.

Field, Richard M. *Natural Resources of the United States.* Barnes and Noble, Inc., New York, N. Y., 1936. 203 pp. (College Outline Series). In outline form, with maps and illustrated statistical material. For teachers and high school students.

Fink, Ollie E. *The Teacher Looks at Conservation.* Ohio Division of Conservation and Natural Resources, Columbus, Ohio, 1940. 64 pp. An elementary teachers' guide.

Fink, Ollie E. *Conservation for Tomorrow's America.* Ohio Division of Conservation and Natural Resources, Columbus, Ohio, 1942. 144 pp. For high school teachers.

Flynn, Harry, and Perkins, Floyd E. *Conservation of the Nation's Resources.* The Macmillan Co., New York, N. Y., 1941. 385 pp. $2. For junior or senior high schools.

Gabrielson, Ira N. *Wildlife Conservation.* The Macmillan Co., New York, N. Y., 1942. $3.50. For teachers and high school students.

Gabrielson, Ira N. *Wildlife Refuges.* The Macmillan Co., New York, N. Y., 1943. $4.50. For teachers and high school students.

Gaer, Joseph. *Men and Trees.* Harcourt, Brace & Co., New York, N. Y., 1939. 118 pp., illus. Describes work of federal agencies, with emphasis on the main activities of the Forest Service. For junior and senior high schools.

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Gustafson, Axel F. and others. *Conservation in the United States.* Comstock Publishing Co., Ithaca, New York, 1939. $3. For senior high school students.

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Harris, Garrard. *Elements of Conservation.* Johnson Publishing Company, Richmond, Va., 1924. 214 pp., illus.

Havemeyer, Loomis and others. *Conservation of Our Natural Resources.* The Macmillan Company, New York, N. Y., 1937. 551 pp., illus. Discusses conservation as program of careful use. For teachers and high school students.

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Holbrook, Stewart H. *Burning an Empire: the Story of American Forest Fires.* The Macmillan Company, New York, N. Y., 1943. $3. For junior and senior high schools.

Illick, Joseph S. *An Outline of General Forestry.* Barnes and Noble, Inc., New York, N. Y., 1938. 275 pp. (College Outline Series). A comprehensive discussion, with questions and bibliographies at the end of each chapter. For teachers and senior high school students.

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Leopold, Aldo. *Game Management.* Charles Scribner's Sons, New York, N. Y., 1933. 481 pp. Includes the history of game control, the habits, range fluctuation and density of game, their refuges, food, cover, water and disease, hunting and predator control. Discusses game management as a profession and the theory and technique of game control. Excellent biology reference.

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Martin, Charles F., and Shepard, F. A. *Conservation and the School.* Klipto Loose Leaf Co., Mason City, Iowa, 1941. 60c. For elementary and junior high schools.

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McDonald, Angus. *Old MacDonald Had a Farm.* Houghton Mifflin Co., Boston, Mass., 1942. 278 pp. $2.75. A story that will be enjoyed by pupils in the upper grades and high school.

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Michigan State Board of Control for Vocational Education. *Soil and Water Conservation and Use*, 1944. 67 pp. Prepared primarily for training farm workers but carries many valuable suggestions for any one teaching conservation. Contains bibliography.

Mitchell, Lucy S. and others. *My Country 'Tis of Thee: The Use and Abuse of Natural Resources.* The Macmillan Co., New York, N. Y. For teachers and senior high school students.

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National Education Association. *Conservation Education in Rural Schools.* 1943 Yearbook, Department of Rural Education. Washington, D. C., 1943. 50c.

National Wildlife Federation, Inc. *My Land and Your Land Series.* Washington, D. C. $1.75 per set ($1.31 to schools and teachers). A series of four booklets for use in elementary schools. Colored and black and white illustrations. Presents problems of soil, water and wildlife conservation. Very readable. Appeals to children.

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Palmer, E. Laurence. *Conservation.* Cornell University, New York State College of Agriculture, Ithaca, N. Y., 1936. 32 pp. (Cornell Rural School leaflet, Vol. 29, No. 3, January 1936). Contains suggestions for conservation of wildlife. Includes instruction for preparation of photographs, plastic casts, drawings for comparison of conservation farms with those that do not conserve and information about surveys of land and land use. For grades four to eight.

Parker, Bertha Morris. *Soil.* Row, Peterson and Company, Chicago, Illinois, 1943. 36 pp. 32c. One of a series of booklets. Illustrated with colored photographs. Unit study booklet or supplementary reader at about the sixth grade level.

Parkins, Almon E., and Whitaker, J. R., editors. *Our National Resources and Their Conservation*. John Wiley and Sons, New York, N. Y., 1936. 650 pp., illus., maps, tables. The extent and distribution of the resources of the United States and their part in regional and national development and planning. For teachers and high school students.

Pennsylvania Department of Public Instruction. *Forest Conservation*. Harrisburg, Pennsylvania, 1939. 108 pp., illus. Contains suggestions for activities, bibliography and sources of visual educational material. For junior and senior high schools.

Person, Harlow S., and others. *Little Waters*. U. S. Government Printing Office, Washington, D. C., 1936. 82 pp., illus. Emphasizes control of "little waters"—creeks, rills, ponds and headwaters—as a factor in flood control. For teachers and high school students.

Powers, Samuel R. *You and the Wealth of the Earth*. Bureau of Education Research in Science. Teachers College, Columbia University, New York, N. Y., 1941. 25c. Reference for teachers.

Price, Overton W. *The Land We Live In*. Dodd, Mead and Company, New York, N. Y., 1936. 237 pp., illus. Tells how children can help conserve and influence others to conserve. For grades four to eight.

Renner, F. G., and Johnson, E. A. *Improving Range Conditions for Wartime Livestock Production*. Bulletin No. 1921. U. S. Department of Agriculture, Washington, D. C., 1942.

Renner, George T., and Hartley, Wm. H. *Conservation and Citizenship*. D. C. Heath & Co., Boston, Mass., 1940. 367 pp. $1.75. Written as a textbook for conservation in junior and senior high schools.

Renner, George T. *Conservation of National Resources*. John Wiley & Sons, New York, N. Y., 1942. $2.75. For junior and senior high schools.

Ross, W. A., and Dale, Tom. *Conserving Farm Lands*. U. S. Office of Education, Federal Security Agency, Washington, D. C., Vocational Bulletin, 1940. An analysis of jobs in making a soil conservation map and plan for farm lands with related science. For vocational agriculture teachers.

Ross, W. A., and Mattoon, Wilbur R. *Farm Forestry*. U. S. Office of Education, Federal Security Agency, Washington, D. C., Vocational Bulletin, 1939. An analysis of farm forestry jobs with related science for vocational agriculture teachers.

Schaeffer, C. H., and Mrs. C. H. *Junior Forestry Notebook*. South Carolina State Commission of Forestry, Columbia, South Carolina, 1947. 104 pp. An attractive book for intermediate grades.

Sears, Paul B. *Deserts on the March*. University of Oklahoma Press, Norman, Oklahoma, 1935. 231 pp. Presents civilization as a destructive force upsetting the delicate interplay of nature. For high schools.

Sears, Paul B. *This Is Our World*. University of Oklahoma Press, Norman, Oklahoma, 1937. 292 pp. $2.50. For teachers and high school students.

Shepard, Ward. *Food or Famine: The Challenge of Erosion*. The Macmillan Company, New York, N. Y., 1945. 225 pp. $3. For supplementary reading in high schools.

Smith, J. Russell. *Man and Resources, a Study of North America and Its Place in World Geography*. Harcourt, Brace and Company, New York, N. Y., 1937. 729 pp., illus., maps, charts. Has suggestions for further reading, thought questions and projects. For high schools.

Social Science Series, *Soil, Water and Man*. Row, Peterson and Company, Chicago, Illinois, 1941. 47 pp., illus. Unit study booklet or supplementary reader. For upper elementary grades.

Soil Conservation Service. *An Outline for Teaching Conservation in High Schools.* U. S. Department of Agriculture, Washington, D. C. Brief discussion of the implications of conservation in several high school subjects with an outline giving objectives, topics for discussion and references for each subject.

Soil Conservation Service. *Our Soil—Its Wastage, Its Preservation.* U. S. Government Printing Office, Washington, D. C., 1936. 20 pp., illus. Clear-cut, instructive pictures. For grades five to eight.

Soil Conservation Service. *Ten Billion Little Dams.* U. S. Government Printing Office, Washington, D. C. 17 pp., illus. Clear-cut and instructive pictures. Can be used as low as grade two. Reading level, grades five to eight.

Soil Conservation Service. *Soil Conservation: Unit Course Number One.* U. S. Government Printing Office, Washington, D. C., 1936. 64 pp.

Soil Conservation Service Region Five. *Topsoil—Its Preservation.* U. S. Government Printing Office, Washington, D. C., 1937. 22 pp. Instructive pictures for all levels. Reading level, grades five to eight.

South Carolina State Commission of Forestry. *My Forestry Notebook.* Columbia, South Carolina. 30 pp. For teachers and pupils of intermediate grades.

Tennessee Valley Authority. *Soil, the Nation's Basic Heritage.* U. S. Government Printing Office, Washington, D. C. 59 pp., illus., charts. Full-page pictures usuable through grades six and seven. Eighth grade reading level.

Tippett, James S. *Paths to Conservation.* D. C. Heath and Company, Boston, Mass., 1937. 299 pp., illus. (Our Animal Books, Vol. 6). Discusses the part children can play in conservation. Much is told in story form. Suggestions for activities for grades five to seven.

Thomas and Vanskee. *Planning the Farm; The Smith's New Garden; Improving the Garden; a Fish Pond on the Farm.* University of Kentucky, Lexington. A series of experimental readers for beginners.

U. S. Forest Service. *Ranger Bill Scott—Forest Ranger.* Department of Agriculture, Washington, D. C., 1946. Prepared in cooperation with New York City schools. Radio scripts free and recordings on loan. Give actual experiences of forest ranger, six episodes of fifteen minutes each. The transcripts can be used only on equipment designed for 33½ RPM.

U. S. Forest Service. *Ranger 'Rithmetic.* U. S. Department of Agriculture, Washington, D. C., 1948. A series of arithmetic problems in conservation. Sixth grade level.

U. S. National Park Service. *Fading Trails, the Story of Endangered American Wildlife.* The Macmillan Company, New York, N. Y., 1942. $3.

Utah Educational Review. *Water and Its Work, Units of Instruction.* Vol. 30: 31-33, 89, September-November 1936. A condensed outline for the junior high school teacher, based upon an activity unit developed in New Rochelle, N. Y.

Van Dersal, William R. *The American Land, Its History and Its Uses.* Oxford University Press, New York, N. Y., 1943. $3.75.

Van Dersal, Wm. R., and Graham, E. H. *The Land Renewed.* Oxford University Press, New York, N. Y., 1946. 110 pp., illus. $2. Reference and for supplementary reading in the intermediate and upper grades.

Vinal, William G. *Bob-White Quail: A Unit of Work in Conservation.* School Science and Mathematics, 35: 379-87, May 1935. Ohio's war to save the bob-white adapted as a project for junior high school study.

Virginia State Board of Education. *The Conservation of Natural Resources: a Bibliography*. 1945. For grades one to twelve.

Wales and Lathrop. *The Conservation of Natural Resources.* Laurel Book Co., Chicago, Illinois, 1944. 554 pp. $2. (Schools $1.50). A textbook for junior or senior high schools.

Weed, Clarence M., and Dearborn, Ned. *Birds in Their Relation to Man.* 4th ed. rev., J. B. Lippincott Company, Philadelphia, Pennsylvania, 1935. 420 pp., illus., maps.

Wisconsin Department of Public Instruction, Madison, Wisconsin. *Teaching of Conservation in Wisconsin Schools*, 1937. Outlines for teaching units on natural resources, with bibliographies. *Helps in Teaching Conservation in Wisconsin Schools*, 1939. Suggestions for integrating conservation with the elementary subjects. *Helps in Planning Conservation Learning Experiences*, 1943. Sample units and bibliography.

Younger, Frank B. *Our Plant and Animal Neighbors: Conservation.* C. C. Nelson Publishing Company, Appleton, Wisconsin, 1929. 225 pp., illus. Suggested nature hobbies for grades five to eight.

PERIODICALS

American Forests. Washington, D. C., The American Forestry Association. Chiefly devoted to trees, forests and forestry, but also includes other subjects closely related to conservation from the viewpoint of forests. Monthly.

Audubon Magazine. New York City, The National Audubon Society. Devoted to the protection and preservation of native wildlife. Bimonthly.

Journal of Forestry. Washington, D. C., The Society of American Foresters. All branches of forestry, wildlife, soils and water. Has full reviews of recent books pertaining to conservation, especially forestry. Monthly. A technical publication.

National Parks Magazine. Washington, D. C., The National Parks Association. Articles of general interest relating to national parks and monuments. Bimonthly.

Nature Magazine. Washington, D. C., The American Nature Association. Articles on all phases of nature study, discussed from the viewpoint of conservation. Monthly.

Parks and Recreation. Rockford, Illinois, The American Institute of Park Executives. Planning, landscaping and care of parks. Monthly.

Reclamation Era. Washington, D. C., U. S. Government Printing Office. Official publication of the Bureau of Reclamation. Includes subjects related to reclamation, such as irrigation and water power. Monthly.

Soil Conservation. Washington, D. C., the Soil Conservation Service, U. S. Department of Agriculture. Includes erosion, soil and water conservation and planning and management. Monthly.

The Land. Columbus, Ohio, Friends of the Land. Dedicated to the conservation of "soil, rain and man." Covers wide range of material. Quarterly.

Federal Agencies Having Responsibilities for Conservation of Natural Resources

Department of Agriculture

Bureau of Agricultural Economics: Has the major function of fact finding in land utilization and determining agricultural policy, consisting of classification of land according to its best economic use, analysis of governmental and legal structures affecting land use, exploration of rural zoning, establishment of cooperative grazing associations, guidance of public land purchase, survey of water resources for irrigation and drainage.

Production and Marketing Administration: Among other duties, has the responsibility for carrying out, through committees composed of cooperating farmers, certain provisions of the Soil Conservation and Domestic Allotment Act, as amended, which authorize payments to agricultural producers for voluntary participation in farm programs to conserve national resources; to prevent the wasteful use of soil fertility; to preserve, maintain and rebuild the farm and ranch land resources in the national public interest; and to improve the purchasing power of the farmers. These programs are closely related to the farm forestry, flood control and other erosion control activities of the U. S. Department of Agriculture.

Forest Service: Is the oldest conservation agency of the government; has general administration of national forests, conducts research in forest management, regulates grazing, conducts timber sales, provides recreation areas, protects forests from fires, insects and disease, manages watersheds. Cooperates in protection and in development of state, community and private forests.

Soil Conservation Service: Promotes the conservation of soil resources by cooperating with private landowners and working on public lands; conducts research in soil and water conservation problems; carries out demonstration projects, involving improving farm management and application of soil-conserving practices, in cooperation with private owners of farm and range land; purchases submarginal lands and improves them for uses other than crop production; aids farmers (in cooperation with the Farm Security Administration) to build suitable water facilities in the western states; demonstrates improved farm forestry methods as part of a farm conservation program; cooperates in all its activities with soil conservation districts that are organized and managed by farmers under state laws for the purpose of conserving farm land resources.

Extension Service: Sponsors forestry and wildlife 4-H Clubs. Does educational work with farmers on land use.

Under the general direction and coordination of the Agricultural Research Administration, the following bureaus contributed to the field of conservation:

Bureau of Agricultural and Industrial Chemistry: Conducts research in chemistry, physics and other sciences with the object of developing new and wider uses for agricultural products.

Bureau of Entomology and Plant Quarantine: Conducts research on forest insect control and administers regulatory measures to prevent importation of insects and diseases; cooperates with states in suppression of introduced pests.

Bureau of Plant Industry—Soils and Agricultural Engineering: Conducts research in forest pathology, in adaptation of plants to soil, classifies and maps soils.

Department of the Interior

Office of Land Utilization: Coordinates and integrates the land-classification, land-use and land management activities of the Department, the establishment and development of sound forestry practices, the general administration of the soil and moisture conservation work and the maintenance of cooperative relations with federal, state and private agencies in the protection and use of public lands of the United States and Alaska.

Bureau of Land Management: Charged with the survey, management and distribution of the public lands and their resources, including the administration of the mining and mineral leasing laws and the Taylor Grazing Act.

Bureau of Indian Affairs: Its work involves management of soils, forests, waters, minerals and wildlife on all Indian lands.

Geological Survey: Conducts investigations on quantity, distribution and availability of minerals, and water supplies in the United States. Classifies public lands as to possibilities of use for water power or storage, and mineral development. Supervises oil, gas and mining operations on public lands included in prospecting permits and leases under mineral leasing laws.

Bureau of Reclamation: Directs investigation of irrigation resources; manages irrigation projects; has supervision over construction of dams for irrigation purposes.

National Park Service: Administers national parks and monuments, preserving them for future generations and utilizing them to the best advantage for recreation.

Bureau of Mines: Investigates methods of mining; preparation and utilization of mineral substances, and the prevention of waste through increased efficiency. Also collects and publishes statistics covering mineral production of the United States, and makes studies of economic problems affecting the mineral industries.

Fish and Wildlife Service: Conserves wildlife; acquires and maintains game refuges and preserves; administers federal wildlife conservation laws; cooperates with states and other federal bureaus in research on wildlife. Aids in the wise management and utilization of the nation's fishery resources, advising and cooperating with the states. Its work comprises the propagation, salvaging and distribution of food fishes to suitable waters; the inquiry into causes of fluctuations in abundance of food fishes in coastal and inland waters; the study of the methods of the fisheries and utilization of fishery products; the collection and compilation of statistics of the fisheries; the conduct of market news service; the administration of the fisheries of Alaska, the blask bass, and whaling treaty acts, and the act authorizing fishery cooperatives.

Coal Mines Administration: Administers the Bituminous Coal Conservation Act of 1935, to conserve the bituminous coal resources of the United States, to stabilize the bituminous coal-mining industry and to promulgate a bituminous coal code.

Oil and Gas Division: Administers the Connally Law, which prohibits shipment in interstate commerce and foreign commerce of petroleum or its products produced in violation of state laws, and coordinates federal policies on oil and gas conservation.

Interdepartmental and Independent

Federal Power Commission: Administers the Federal Water Power Act which provides for improvement of navigation and regulation of water power development on navigable streams. Regulates interstate sale of natural gas. Is authorized to investigate

effect of entry under the public land laws on the value of public lands for water power purposes and to recommend reservation of public lands for water power purposes.

Tennessee Valley Authority: Promotes adoption of improved practices in watershed protection and development of forest, fish and wildlife resources in the Tennessee River watershed. Surveys and plans for the proper use of land and other natural resources for the general social and economic well-being of the valley.

National Forest Reservation Commission: Purchases for addition to national forests such forested, cut-over or denuded lands within the watersheds of navigable streams necessary for the regulation of stream flow.

Non-Governmental Agencies and Organizations Active in Conservation

American Forestry Association, Washington, D. C. Promotes and aids in coordinating conservation education nationally. Publishes the monthly magazine *American Forests* and numerous books on renewable natural resources.

American Forest Products Industries, Inc., Washington, D. C. A trade association of lumber, pulp and paper, plywood and other forest industries. Publishes booklets and study aids in forest conservation.

American Tree Association, Washington, D. C. Publishes books and bulletins on forestry and otherwise encourages conservation.

American Nature Association, Washington, D. C. Publishes books, *Nature Magazine* and other materials to stimulate public interest in nature and the out-of-doors.

American Wildlife Foundation, Washington, D. C. An organization for the restoration of North American wildlife.

Educational Conservation Society, Woodside, Long Island, New York. Promotes teaching of conservation in the schools.

Izaak Walton League of America, Inc., Chicago, Illinois. Prepares and distributes material on woods, waters and wildlife. Publishes *Outdoor America.* Encourages organization of Junior Izaak Walton Leagues.

National Association of Audubon Societies, New York, N. Y. Prepares information and material relating to birds. Publishes *Audubon Magazine.*

National Parks Association, Washington, D. C. An organization for the protection and development of national parks. Publishes *National Parks Magazine.*

National Wildlife Federation, Washington, D. C. A federation of state organizations. Has published a series of four booklets entitled *My Land and Your Land* for elementary grades.

Wilderness Society, Washington, D. C. Publishes *The Living Wilderness.* Encourages activities directed toward the preservation of remaining wilderness on state and private lands which have no governmental protection.

Federated Women's Clubs: Has an extensive organization for developing interest in conservation. States and many local groups have active committees headed up in a national conservation committee. Prepares material for study groups in cooperation with agencies and supports conservation measures in the field and legislative bodies.

VISUAL AIDS

The wildlife, waters, fields and forests of the school community are of first importance as visual aids.

To secure other visual aids to supplement these, communicate with local or state film libraries.

The U. S. Department of Agriculture 16 mm. sound films listed below may be secured from many such sources on a rental basis. They may be purchased from Castle Films, 135 S. LaSalle Street, Chicago, Illinois.

A Heritage We Guard. 30 minutes. Traces the early exploitation of wildlife for hides and skins, gradual westward movement of trappers and settlers, and thoughtless exploitation of the land. Shows the interrelation of wildlife and soil conservation.

Blessings of Grass. 20 minutes. Shows range management in the western national forests; protection of grazing lands from over-use; and the resultant improvements to the community.

Food and Soil. 10 minutes, color. Highlights of soil conservation with emphasis upon the relationship between food and productive soil.

Forests Forever. 26 minutes, color. Shows how to stop destructive forest cutting practices, restore and maintain a growing stock of healthy trees, and thus safeguard future forests.

Grassland. 10 minutes. Discusses the problem of soil conservation on the grazing lands of the arid Southwest.

Harvest for Tomorrow. 27 minutes. Shows the basic need for soil conservation and the use of soil building practices in the Northeastern States.

Home on the Range. 11 minutes. Shows the western range country, the cattle and sheep, and the men who make up the real West.

In Common Cause. 19 minutes. Shows what soil conservation districts have accomplished, and how they are formed and operated.

Muddy Waters. 9 minutes. Story of land abuse in the Southwest. Shows conditions when the white man came and how over-grazing and farming depleted the vegetation leaving the land barren and subject to floods and erosion. Stresses need for soil conservation.

Realm of the Wild. 28 minutes, color. America's wild animals and birds in our national forests. Stresses the relationship between wildlife population and the available food supply.

Recreation. 33 minutes. A vacation trip through some of the national forests which, in addition to their scenic and recreational value, serve as storehouses for water, a means of preventing floods, and a source of lumber supply.

Save the Soil. 11 minutes. Shows various ways of conserving soil fertility, including terracing and cover-cropping to prevent erosion; crop rotation; use of manures and commercial fertilizers.

Snow Harvest. 25 minutes, color. Shows how the winter snowfall in the western mountains is measured as a basis for predicting next summer's water supply.

The Forest Ranger. 32 minutes. Gives a composite picture of the forest ranger at work: reveals the ideals of public service that motivate him, and some of the benefits that Americans receive from his activities.

The Golden Secret. 7 minutes, color. Tells a fairy story of a boy's discovery of the way to conserve the golden soil that grows the golden grain, and of his reward from the king.

The River. 32 minutes. A dramatic documentary film of the Mississippi River—what it has done and what man has done to it. A persuasive indictment of our practices of the past and what we should do in the future if we are to avoid soil and lumber losses and the disastrous effects of floods.

There's More Than Timber in Trees. 33 minutes, color. Through the story of an old lumberjack, the film shows the effects of uncontrolled forest cutting practices and the need for conservation.

Tree of Life. 19 minutes. Covers the importance of our forests, the aims and achievements of the U. S. Forest Service, and the methods of forest management.

Trees to Tame the Wind. 12 minutes. Shows the planting of field windbreaker- and shelterbelts in the prairie states in order to reclaim land ruined by wind and drought.

Vanishing Herds. 14 minutes. A grandfather tells his grandchildren how bison, elk, and other game animals, once plentiful, have been almost exterminated and what is being done to restore and protect them.

Wise Land Use Pays. 19 minutes. Discusses the principles of soil conservation and control with sequences showing recovery of gullied land, checking of erosion and return of land to timber or pasture where suitable.

CATALOGS OF EDUCATIONAL FILMS

Educational Film Guide. New York, N. Y. H. W. Wilson Co., 950 University Avenue. Cumulative annual catalog with monthly supplements. $3.00. Title index, subject classification, brief description, evaluative comments.

One Thousand and One. Chicago, Ill., Educational Screen, 64 East Lake Street. $1.00. Annual listing of films, classified by subjects.

Educators Guide to Free Films. Randolph, Wisconsin, Educators Progress Service. $5.00. Annual listing of films and filmstrips. Title index, subject classification, cross-index, brief descriptions.

Guide to United States Government Motion Pictures. Washington, D. C., Superintendent of Documents. 40c. Library of Congress listing, by subject matter classification, all U. S. Government films available to the public in 1947.

STATE FORESTRY AGENCIES

ALABAMA—State Forester, State Department of Conservation, 5 N. Bainbridge Street, Montgomery 4

ARIZONA—Commissioner, State Land Department, Phoenix

ARKANSAS—Director, Division of Forestry and Parks, Resources & Development Commission, P. O. Box 194, Little Rock

CALIFORNIA—State Forester, Department of Natural Resources, Sacramento

COLORADO—State Forester, Board of Forestry, 124 Capitol Bldg., Denver 2

CONNECTICUT—State Forester, Department of Conservation, 165 Capitol Avenue, Hartford

DELAWARE—State Forester, State Forestry Department, State House, Dover

FLORIDA—State Forester, Florida Board of Forestry & Parks, P. O. Box 1200, Tallahassee

GEORGIA—Director, Department of Forestry, 435 State Capitol, Atlanta 3

HAWAII—Territorial Forester, P. O. Box 3319, Honolulu

IDAHO—State Forester, Cooperative Board of Forestry, 801 Capitol Blvd., Boise

ILLINOIS—State Forester, Department of Conservation, 301½ E. Monroe Street, Springfield

INDIANA—State Forester, Department of Conservation, Indianapolis

IOWA—Head, Forestry Department, Iowa State College, Ames

KANSAS—Extension Forester, Kansas State College, Manhattan

KENTUCKY—Director, Division of Forestry, Department of Conservation, Frankfort

LOUISIANA—State Forester, Department of Conservation, P. O. Box 1269, Baton Rouge

MAINE—Forest Commissioner, Department of Conservation, Augusta

MARYLAND—State Forester, Department of State Forests & Parks, State Office Bldg., Annapolis

MASSACHUSETTS—Commissioner of Conservation, 15 Ashburton Place, Boston

MICHIGAN—Director, Department of Conservation, Lansing

MINNESOTA—Division of Forestry, State Office Bldg., St. Paul

MISSISSIPPI—State Forester, Forest and Park Service, First Federal Savings & Loan Bldg., Jackson

MISSOURI—State Forester, Conservation Commission, Jefferson City

MONTANA—State Forester, Montana State University, Missoula

NEBRASKA—Extension Forester, College of Agriculture, Lincoln

NEVADA—State Forester-Fire Warden, Carson City

NEW HAMPSHIRE—State Forester, Forestry and Recreation Commission, Concord

NEW JERSEY—State Forester, Department of Conservation, State House Annex, Trenton

NEW MEXICO—Commissioner of Public Lands, Santa Fe

NEW YORK—Director, Division of Lands and Forests, Conservation Department, Albany

NORTH CAROLINA—State Forester, Department of Conservation & Development, 204 State Education Bldg., Raleigh

NORTH DAKOTA—State Forester, Department of Conservation, Bottineau

OHIO—State Forester, Ohio Division of Forestry, Wooster

OKLAHOMA—Director, Division of Forestry, Oklahoma Planning and Resources Board, 536 State Capitol, Oklahoma City 5

OREGON—State Forester, Department of Conservation, Salem

PENNSYLVANIA—Chief, Bureau of Forests, Department of Forests and Waters, Har risburg

PUERTO RICO—Forest Service, P. O. Box 577, Rio Peidras

RHODE ISLAND—Chief Forester, Department of Conservation, 18 State House, Providence

SOUTH CAROLINA—State Forester, State Commission of Forestry, 506 Calhoun Office Bldg., Columbia

SOUTH DAKOTA—State Forester, Department of Game, Fish and Parks, Pierre

TENNESSEE—State Forester, Department of Conservation, 309 New State Office Bldg., Nashville 3

TEXAS—Director, Texas Forest Service, College Station 5

UTAH—Chief Forester, School of Forestry, Logan

VERMONT—State Forester, Forest Service, Montpelier

VIRGINIA—State Forester, University Station, Charlottesville

WASHINGTON—Supervisor, Division of Forestry, Department of Conservation and Development, Olympia

WEST VIRGINIA—State Forester, Department of Conservation, Charleston

WISCONSIN—Director of Conservation, Department of Conservation, Madison

WYOMNG—Extension Forester, University of Wyoming, Laramie

STATE EXTENSION FORESTERS

ALABAMA—Alabama Polytechnic Institute, Auburn

ARAKANSAS—524 Post Office Building, Little Rock

CALIFORNIA—University of California, Berkeley 4

COLORADO—Colorado State College of A and M Arts, Fort Collins

CONNECTICUT—University of Connecticut, Storrs

FLORIDA—University of Florida, Gainesville

GEORGIA—State College of Agriculture, Athens

IDAHO—University of Idaho, Moscow

ILLINOIS—College of Agriculture, University of Illinois, Urbana

INDIANA—Purdue University, LaFayette

IOWA—State College of Agriculture, Ames

KANSAS—State College of Agriculture, Manhattan

KENTUCKY—State College of Agriculture, Lexington 29

LOUISIANA—Louisiana State University, University Station, Baton Rouge 3

MAINE—College of Agriculture, University of Maine, Orono

MARYLAND—University of Maryland, College Park

MASSACHUSETTS—Massachusetts State College, Amherst

MICHIGAN—Michigan State College, East Lansing

MINNESOTA—Department of Agriculture, University of Minnesota, University Farm, St. Paul 8

MISSISSIPPI—Mississippi State College, State College

MISSOURI—Missouri State College, Columbia

MONTANA—Montana State College, Bozeman

NEBRASKA—College of Agriculture, Lincoln 1

NEVADA—Federal Building, Carson City

NEW HAMPSHIRE—University of New Hampshire, Durham

NEW JERSEY—College of Agriculture, New Brunswick

NEW YORK—College of Agriculture, Ithaca

NORTH CAROLINA—State College Station, Raleigh

NORTH DAKOTA—North Dakota Agricultural College, Fargo

OHIO—Agricultural Experiment Station, Wooster

OKLAHOMA—Oklahoma A. and M. College, Stillwater

OREGON—Oregon State Agricultural College, Corvallis

PENNSYLVANIA—Pennsylvania State College, State College

RHODE ISLAND—Rhode Island State College, Kingston

SOUTH CAROLINA—Clemson Agricultural College, Clemson

SOUTH DAKOTA—State College of Agriculture, Brookings

TENNESSEE—College of Agriculture, University of Tennessee, Knoxville 7

TEXAS—A. and M. College of Texas, College Station

UTAH—Agricultural College of Utah, Logan

VERMONT—481 Main Street, Burlington

VIRGINIA—Virginia Polytechnic Institute, Blacksburg

WASHINGTON—State College of Washington, Pullman

WEST VIRGINIA—West Virginia University, Morgantown

WISCONSIN—College of Agriculture, University of Wisconsin, Madison 6

WYOMING—University of Wyoming, Laramie

REGIONAL OFFICES OF U. S. FOREST SERVICE

Northern Region—Federal Building, Missoula, Montana (Montana, northeastern Washington, northern Idaho, and northwestern South Dakota)

Rocky Mountain Region—Post Office Building, Denver 2, Colorado (Colorado, Kansas, Nebraska, South Dakota and Wyoming)

Southwestern Region—Post Office Building, Albuquerque, New Mexico (Arizona and New Mexico)

Intermountain Region—Forest Service Building, Ogden, Utah (Utah, southern Idaho, western Wyoming and Nevada)

California Region—630 Sansome Street, San Francisco 11, California (California)

North Pacific Region—Post Office Building, Portland 8, Oregon (Washington and Oregon)

Eastern Region—Bankers Securities Building, Philadelphia 7, Pennsylvania (Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, Pennsylvania, New Jersey, Delaware, Maryland, West Virginia, Virginia and Kentucky)

Southern Region—Glenn Building, Atlanta, Georgia (Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee and Texas)

North Central Region—Madison Building, 623 N. 2nd Street, Milwaukee 3, Wisconsin (Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, North Dakota, Ohio and Wisconsin)

Alaska Region—Federal and Territorial Building, Juneau, Alaska

STATE PARK AGENCIES

ALABAMA—Division of State Parks, 7 North Bainbridge Street, Montgomery 4
ARIZONA—Saguaro Forest State Park, University of Arizona, Tucson
ARKANSAS—Division of Forests & Parks, P. O. Box 1940, Little Rock
CALIFORNIA—Division of Beaches & Parks, 1211 16th Street, Sacramento 14
CONNECTICUT—Park Department, 165 Capitol Avenue, Hartford
DELAWARE—State Park Commission, 225 State Street, Dover
FLORIDA—Florida Park Service, P. O. Box 1200, Tallahassee
GEORGIA—Department of State Parks, 418 State Capitol, Atlanta 3
IDAHO—Department of Public Works, State Capitol, Boise
ILLINOIS—Division of Parks & Memorials, 604 Armory Bldg., Springfield
INDIANA—Division of State Parks, Lands & Waters, 405 State Library Bldg., Indianapolis 9
IOWA—State Conservation Commission, 10th and Mulberry Street, Des Moines 8
KANSAS—Forestry, Fish & Game Commission, Pratt
KENTUCKY—Division of Parks, 737 New State Office Bldg., Frankfort
LOUISIANA—State Parks Commission, 218 Balter Bldg., New Orleans 12
MAINE—State Parks Commission, Augusta
MARYLAND—Department of State Forests & Parks, State Office Bldg., Annapolis
MASSACHUSETTS—Division of Parks & Recreation, 15 Ashburton Place, Boston 18
MICHIGAN—Parks & Recreation Division, 400 Bauch Bldg., Lansing
MINNESOTA—Division of State Parks, 6 State Office Bldg., St. Paul 1
MISSISSIPPI—Forest & Park Service, 1st Federal Savings & Loan Bldg., Jackson
MISSOURI—State Park Board, Monroe Bldg., Jefferson City
MONTANA—State Park Commission, State University, Missoula
NEBRASKA—Game Forestation and Parks Commission, Lincoln 9
NEVADA—State Park Commission, Carson City
NEW HAMPSHIRE—Forestry & Recreation Department, Concord
NEW JERSEY—Division of Forestry, Geology, Parks and Historic Sites, State House Annex, Trenton 7
NEW MEXICO—State Park Board, P. O. Box 958, Santa Fe
NEW YORK—Division of Parks, 507 Arcade Bldg., Albany
NORTH CAROLINA—Division of Forestry & Parks, Box 2719, Raleigh
NORTH DAKOTA—State Historical Society, Bismarck
OHIO—Inland Lakes & Parks Section, 1106 State Office Bldg., Columbus 15
OKLAHOMA—Division of Recreation and State Parks, State Capitol Bldg., Oklahoma City 5
OREGON—State Parks Department, First National Bank Bldg., Salem
PENNSYLVANIA—Bureau of Parks, Harrisburg
PUERTO RICO—Insular Park Service, Box 5097, Puerta de Tierra Streets, San Juan
RHODE ISLAND—Division of Forests & Parks, 18 State House, Providence
SOUTH CAROLINA—Division of State Parks, 506 Calhoun State Office Bldg., Columbia
SOUTH DAKOTA—Department of Game, Fish and Parks, Pierre
TENNESSEE—Division of State Parks, Nashville 3
TEXAS—State Park Board, 106 E. 13th Street, Austin
UTAH—Department of Publicity & Industrial Development, Salt Lake City
VERMONT—Forest Service, Montpelier
VIRGINIA—Division of Parks, Life Insurance Company of Virginia Bldg., Richmond 19
WASHINGTON—State Parks and Recreation Commission, Legislative Bldg., Olympia
WEST VIRGINIA—Division of State Parks, Charleston
WISCONSIN—Forests & Parks Division, State Office Bldg., Madison 2
WYOMING—State Board of Charities and Reform, Capitol Bldg., Cheyenne

STATE FISH AND WILDLIFE AGENCIES

ALABAMA—Department of Conservation, Montgomery
ARIZONA—Game and Fish Commission, Phoenix
ARKANSAS—Game and Fish Commission, State Capitol, Little Rock
CALIFORNIA—Fish and Game Commission, Ferry Bldg., San Francisco
COLORADO—Game and Fish Commission, 1350 Sherman Street, Denver
CONNECTICUT—Board of Fisheries & Game, Hartford 1
DELAWARE—Board of Game & Fish Commissioners, Dover
FLORIDA—Game and Fresh Water Fish Commission, Tallahassee
GEORGIA—Game & Fish Commission, 412 State Capitol, Atlanta
HAWAII—Board of Commissioners of Agriculture and Forestry, P. O. Box 3319, Honolulu 1
IDAHO—Department of Fish & Game, Boise
ILLINOIS—Department of Conservation, Springfield
INDIANA—Conservation Department, Division of Fish & Game, Indianapolis
IOWA—Conservation Commission, Division of Fish & Game, Des Moines
KANSAS—Forestry, Fish & Game Commission, Pratt
KENTUCKY—Department of Conservation, Division of Game & Fish, Frankfort
LOUISIANA—Department of Wildlife and Fisheries, Civil Courts Bldg., New Orleans 8
MAINE—Department of Inland Fisheries & Game, State House, Augusta
MARYLAND—Department of Game & Inland Fish, 514 Munsey Bldg., Baltimore 2
MASSACHUSETTS—Department of Conservation, Division of Fisheries and Game, 15 Ashburton Place, Boston 8
MICHIGAN—Conservation Commission, Lansing 13
MINNESOTA—Department of Conservation, Division of Game & Fish, St. Paul 1
MISSISSIPPI—State Game & Fish Commission, 330 East Pearl Street, Jackson 104
MISSOURI—Conservation Commission, Jefferson City
MONTANA—Fish & Game Commission, Helena
NEBRASKA—Game, Forestation & Parks Commission, Lincoln 9
NEVADA—Fish & Game Commission, Reno
NEW HAMPSHIRE—Fish & Game Dept., State House Annex, Concord
NEW JERSEY—Board of Fish & Game Commissioners, State House, Trenton
NEW MEXICO—Game and Fish Commission, Santa Fe
NEW YORK—Conservation Dept., Division of Fish & Game, Albany
NORTH CAROLINA—Dept. of Conservation & Development, Raleigh
NORTH DAKOTA—Game & Fish Dept., Bismarck
OHIO—Dept. of Agriculture, Division of Conservation & Natural Resources, Columbus
OKLAHOMA—Game & Fish Commission, Oklahoma City 5
OREGON—State Game Commission, 616 Oregon Bldg., Portland 4
PENNSYLVANIA—Game Commission *or* Board of Fish Commissioners, Harrisburg
PUERTO RICO—Division of Fisheries & Wildlife, San Juan
RHODE ISLAND—Division of Fish & Game, State House, Providence 2
SOUTH CAROLINA—Game & Fish Dept., Columbia
SOUTH DAKOTA—Dept. of Game, Fish & Parks, Pierre
TENNESSEE—Division of Game & Fish, 304 State Office Bldg., Nashville 10
TEXAS—Game, Fish & Oyster Commission, Austin
UTAH—Fish & Game Service, Montpelier
VIRGINIA—Commission of Game & Inland Fisheries, Travelers Bldg., Richmond 13
WASHINGTON—State Game Commission, 515 Smith Tower, Seattle
WEST VIRGNIA—Conservation Commission of West Virginia, Charleston
WISCONSIN—Conservation Commission, Madison
WYOMING—Game & Fish Commission, Cheyenne

SOIL CONSERVATION SERVICE STATE OFFICES

Address inquiries to State Conservationist, Soil Conservation Service, at the following addresses:

ALABAMA—Alabama Polytechnic Institute, Auburn
ARIZONA—14 North Central Avenue, Phoenix
ARKANSAS—Post Office Bldg., Little Rock
CALIFORNIA—Woolsey Bldg., 2168 Shattuck Avenue, Berkeley
COLORADO—225 South College Avenue, Fort Collins
CONNECTICUT—Storrs
DELAWARE—Post Office Bldg., Newark
FLORIDA—Smith Bldg., 129 So. Pleasant Street
GEORGIA—Post Office Bldg., Athens
IDAHO—9th and Main Street, Lafayette Loan & Trust Bldg., Lafayette
KANSAS—Public Utility Bldg., 116½ Woodrow Street, Salina
KENTUCKY—Short and Upper Streets, Lexington
LOUISIANA—State University, Baton Rouge
MAINE—University of Maine, Orono
MARYLAND—University of Maryland, College Park
MASSACHUSETTS—State College, Amherst
MICHIGAN—State College, East Lansing
MINNESOTA—Federal Courts Bldg., St. Paul
MISSISSIPPI—Masonic Temple Bldg., Jackson
MISSOURI—Post Office Bldg., Columbia
ILLINOIS—204 W. California Street, Urbana
MONTANA—Maine Street and Black Avenue, Bozeman
NEBRASKA—13th and N Streets, Lincoln
NEVADA—University of Nevada, Reno
NEW HAMPSHIRE—University of New Hampshire, Durham
NEW MEXICO—114½ N. Third Street, Albuquerque
NEW JERSEY—Post Office Bldg., New Brunswick
NEW YORK—Sprague Block Bldg., 147-151 E. State Street, Ithaca
NORTH CAROLINA—State College, Raleigh
NORTH DAKOTA—Post Office Bldg., Bismarck
OHIO—3rd and Broad Streets, Columbus
OKLAHOMA—2nd and Harvey Streets, Cotton Exchange Bldg., Oklahoma City
OREGON—220-230 South 3rd Avenue, Corvallis
PENNSYLVANIA—203 Market Street, Harrisburg
RHODE ISLAND—Kingston
SOUTH CAROLINA—Farm Credit Administration Bldg., Columbia
SOUTH DAKOTA—Huron
TENNESSEE—Medical Arts Bldg., Nashville
TEXAS—114-118 S. 3rd Street, Temple
UTAH—248 South Main Street, Salt Lake City
VERMONT—Chace Hill Bldg., Burlington
VIRGINIA—Jackson and Main Streets, Blacksburg
WASHINGTON—College Station, Pullman
WEST VIRGINA—265 High Street, Morgantown
WISCONSIN—18-20 N. Carroll Street, Madison
WYOMING—207-211 Grand Avenue, Laramie

STATE AGENCIES DEALING WITH MINERALS AND WATERS

ALABAMA—State Geologist, Geological Survey of Alabama, University

ARIZONA—State Geologist, Arizona Bureau of Mines, Tucson

ARKANSAS—State Geologist, Division of Geology, Arkansas Resources and Development Commission, Little Rock

CALIFORNIA—State Geologist, Department of Natural Resources, San Francisco

COLORADO—State Geologist, Geological Survey Board, Denver

CONNECTICUT—State Geologist, State Geological and Natural History Survey, Hartford

FLORIDA—State Geologist, Board of Conservation, Tallahassee

GEORGIA—State Geologist, Department of Mines, Mining & Geology, State Division of Conservation, Atlanta

IDAHO—State Geologist, Idaho Bureau of Mines & Geology, Moscow

ILLINOIS—State Geologist, Department of Public Works and Buildings, Springfield

INDIANA—State Geologist, Division of Geology, State Department of Conservation, Bloomington

IOWA—State Geologist, Iowa Geological Survey, Iowa City

KANSAS—State Geologist, State Board of Agriculture, Lawrence

KENTUCKY—State Geologist, State Department of Mines & Minerals, Lexington

LOUISIANA—State Geologist, Department of Conservation, Baton Rouge

MAINE—State Geologist, State Geological Survey, Orono

MARYLAND—State Geologist, Department of Geology, Mines and Water Resources, Baltimore

MASSACHUSETTS—State Department of Public Works, Boston

MICHIGAN—State Geologist, Department of Conservation, Lansing

MINNESOTA—State Geologist, Minnesota Geological Survey, Minneapolis

MISSISSIPPI—State Geologist, Mississippi Geological Survey, University

MISSOURI—State Geologist, Missouri Geological Survey & Water Resources, Rolla

MONTANA—State Geologist, State Bureau of Mines & Geology, Butte

NEBRASKA—State Geologist, Nebraska Geological Survey, Lincoln

NEVADA—State Geologist, Nevada Bureau of Mines, Reno

NEW HAMPSHIRE—State Geologist, State Planning & Development Commission, Durham

NEW JERSEY—State Geologist, Division of Geology and Topography, Department of Conservation, Trenton

NEW MEXICO—State Geologist, State Bureau of Mines & Mineral Resources, Socorro

NEW YORK—State Geologist, New York State Museum, Albany

NORTH CAROLINA—State Geologist, Division of Mineral Resources, State Department of Conservation & Development, Raleigh

NORTH DAKOTA—State Geologist, North Dakota Geological Survey, Grand Forks

OHIO—State Geologist, Ohio Division of Geological Survey, Columbus

OKLAHOMA—State Geologist, Oklahoma Geological Survey, Norman

OREGON—State Geologist, State Department of Geology and Mineral Industries, Portland

PENNSYLVANIA—State Geologist, Bureau of Publications, Department of Property and Supplies, Department of Forests & Water, Harrisburg

RHODE ISLAND—State Geologist, Mineral Resources Committee Rhode Island Industrial Commission, Providence

SOUTH CAROLINA—State Geologist, South Carolina Geological Survey, Columbia

SOUTH DAKOTA—State Geologist, State Geological Survey, Vermillion

TENNESSEE—State Geologist, Division of Geology, Tennessee Department of Conservation, Nashville

TEXAS—State Geologist, Bureau of Economic Geology, Austin

VERMONT—State Geologist, State Department of Natural Resources, Burlington

VIRGINIA—State Geologist, Virginia Conservation Commission, University Station, Charlottesville

WASHINGTON—State Geologist, Division of Mines & Geology, State Department of Conservation and Development, Olympia

WEST VIRGINIA—State Geologist, West Virginia Geological & Economic Survey, Morgantown

WISCONSIN—State Geologist, State Geological and Natural History Survey, Madison

WYOMING—State Geologist, Geological Survey of Wyoming, Laramie

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